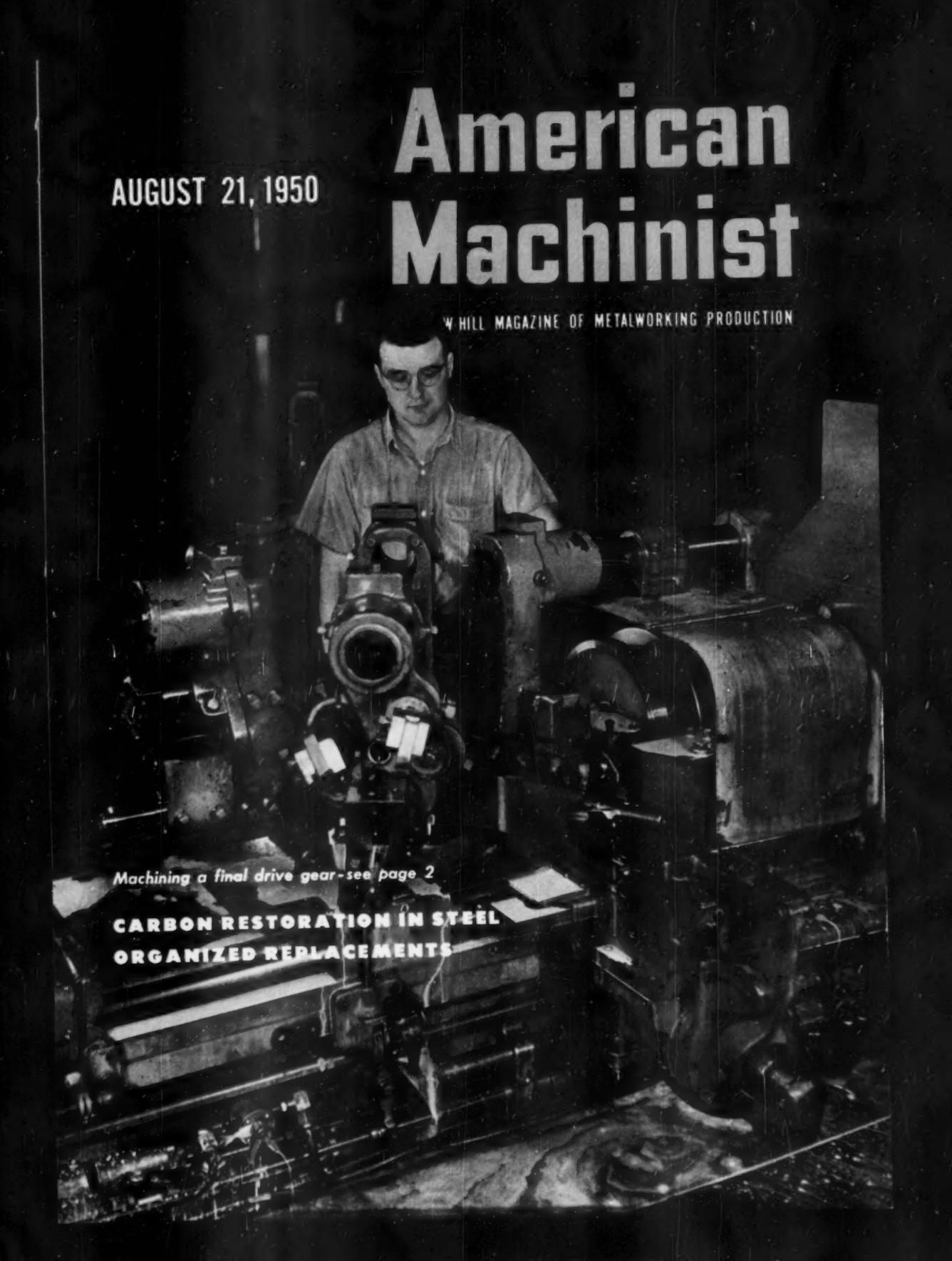
AUGUST 21, 1950

American Machinist

W HILL MAGAZINE OF METALWORKING PRODUCTION



Machining a final drive gear - see page 2

CARBON RESTORATION IN STEEL

ORGANIZED REPLACEMENTS

put yourself in this picture

THE HEALD MACHINE COMPANY
WORCESTER 6, MASSACHUSETTS

MEMO — to you

You are cordially invited to visit our plant here in Worcester — to see for yourself what the new Heald equipment can do to help you cut costs and step up the production of your precision finished parts.

Whether you're from Missouri — or anywhere else — there's nothing quite like seeing for yourself. And you'll see some mighty interesting things when you visit the Heald plant. You'll get lots of new ideas, too. Ideas that you can translate directly into time and cost savings on your own production line.

In the Heald exhibition room, you'll see working applications on the new line of Heald machines—the only completely new line ever brought out at one time by any machine tool manufacturer. You'll see how these machines are built and — still more important — what they can do!

While you're here, Heald engineers will be glad to discuss your own precision finishing problems — to give you the benefit of their unequalled record of experience in all kinds of borizing, internal grinding and surface grinding applications.

Remember — when it comes to precision finishing, it pays to come to Heald.

THE HEALD MACHINE COMPANY

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American Machinist

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Chips and Quips

One of Two . . . Our cover Kodachrome shows the final drive gear for an Allis-Chalmers W-D tractor being machined on a Gisholt 2F "Fastermatic" automatic turret lathe. The 14 1/16-in. forged-steel gear blank is machined all over in two operations, in two machines run by a single operator. A part is completed every 6½ min. The photograph, taken by Henry Serdy at Allis-Chalmers in Milwaukee, is a bit unusual in that coolant is shown as it actually looks.

Think! . . . International Business Machines has long been known as a progressive organization, so we asked about their replacement program. We found, as we expected, that their program is a live and working one, resulting in reduced machining time per piece and higher-quality production. Associate Editor Mike Rowan gives you the story in our lead article. As the saying goes, "It gives one to think."

Rubber Dies . . . Short runs of small blanked and formed parts can be made with rubber dies. William J. Bachman of the Tube Dept., RCA, shows how in this issue. With this process, parts in Kovar, moly, stainless, and non-metallic materials can frequently be produced the same day they are ordered. Details are included of the RCA studies on the subject; proper rubber hardness is the key to success.

Carbon Restoration . . . E. C. Bishop, metallurgical engineer at Westinghouse, has put together for you an unusual article that solves the problem of "soft skin" on parts. He details how such decarburized surfaces can be restored to their original carbon content by either batch or continuous heat-treatment, with automatic generators for suitable furnace atmospheres. The story is so jam-packed with information that we converted it into a Special Report. Charts are included, plus suggestions for combining this operation with annealing or other heat-treating operations, thus saving time and trouble.

Tooling . . . In addition to other tooling articles, Mario Martellotti continues with his series on production milling, this one being the ninth . . . There's also a description of a hydraulic duplicator for cam milling, used at Cooper-Bessemer and explained by J. F. Stevenson, asst. works manager. It halved machining time and cut out expensive hand operations . . . J. R. Paquin is in again with the data on compound dies. He puts the punch on the die holder — and finishes parts at one stroke . . . There's also two pages of "Talented Tooling", showing a flaring die, a special drilling head, a hydraulic-tracer cam miller, and a corner-forming die . . . And two pages of "Shop Shots" as well.

Fixtures . . . Three articles in this issue describe special fixtures, one for milling, one for welding, and one for eyelet assembly . . . Paul Janke, tool engineer at Monroe Calculating Machine, explains his automatic indexing fixture for milling unequally spaced slots; burring, checking and arbor preloading cut costs on this close-tolerance job . . . Henry Gillig, plant manager of the Electric Division, Stewart-Warner, describes jigs that locate parts of TV or radio sets for eyelet assembly. They're principally of aluminum . . . Two engineers at the Hawthorne Works of Western Electric developed eight fixtures on a dial arrangement that rotates under a spotwelder; clever — and fast.

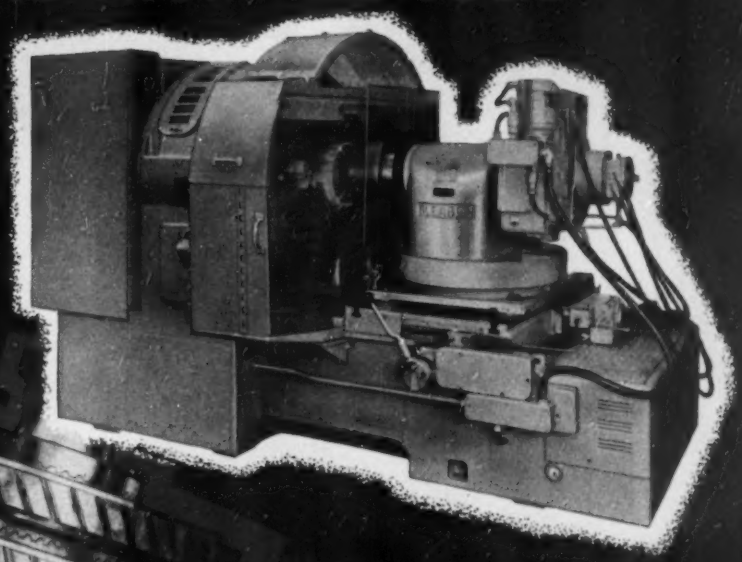
Coming . . . Sept. 4 *AM* will include a special Report on Honing, and a dozen or so short articles. The Report required Associate Editor Jim Linsley to do considerable traveling — as far west as St. Louis—but it combines all the latest data. Article subjects include distortion in machining, fine-pitch hobbing, screw-machine setups, press maintenance, press tools for pipe, photo-templets for layout, welding carriers, machining the Buick water pump, tube reducing, and another instalment of Martellotti on milling.

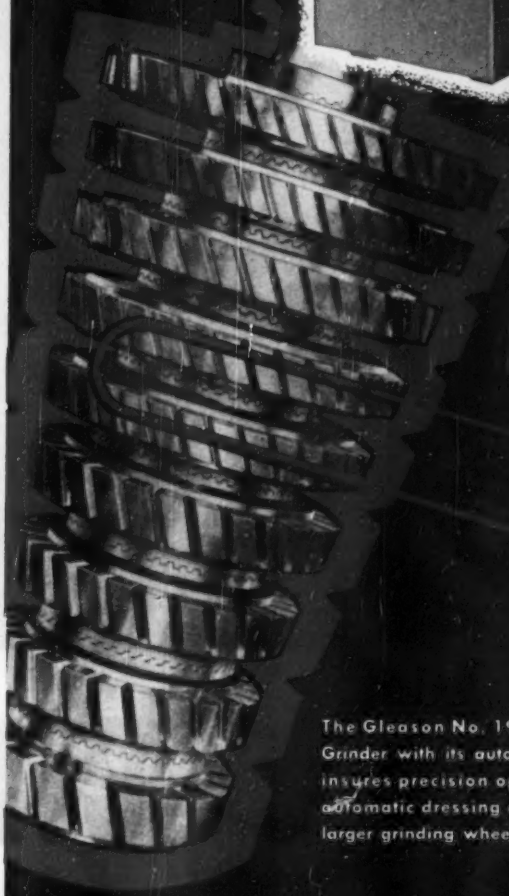
ART DIRECTOR . . . Sydney Oxberry has easily one of the toughest jobs on *AM*—planning clear, easily understood graphic material. Drawings become illustrations by rearrangement, shading, and other devices; photos are retouched and cropped to bring out wanted detail. It takes the eye of an experienced mechanic and the hand of a skilled artist, and Syd has both.

He went through apprenticeship training in England before he started doing sketches for the British *Motor* magazine. After coming to this country, Syd worked as staff artist and art director on *Motor*, *Popular Science*, *Chain Store Age*, and others, as well as doing free-lance work. His hobby is making watercolor landscapes.

Syd's work calls for rapid sketches in pencil, quick understanding of the "nugget" of a story, and planning the layout around that point. He's a good editor, too—catches mistakes in drawings and text that other editors sometimes miss.

INTERCHANGEABLE COUPLINGS GROUND FROM THE SOLID





• The Gleason No. 19 Curvic Coupling Grinder produces ground Curvic and Zerol face couplings automatically with a uniformity of machining which makes each part interchangeable. Replacement costs of large units can be materially reduced by using built-up units employing the principle of the permanent couplings.

The Gleason No. 19 Curvic Coupling Grinder with its automatic cycle control insures precision operation while the automatic dressing operation provides larger grinding wheel and diamond life.

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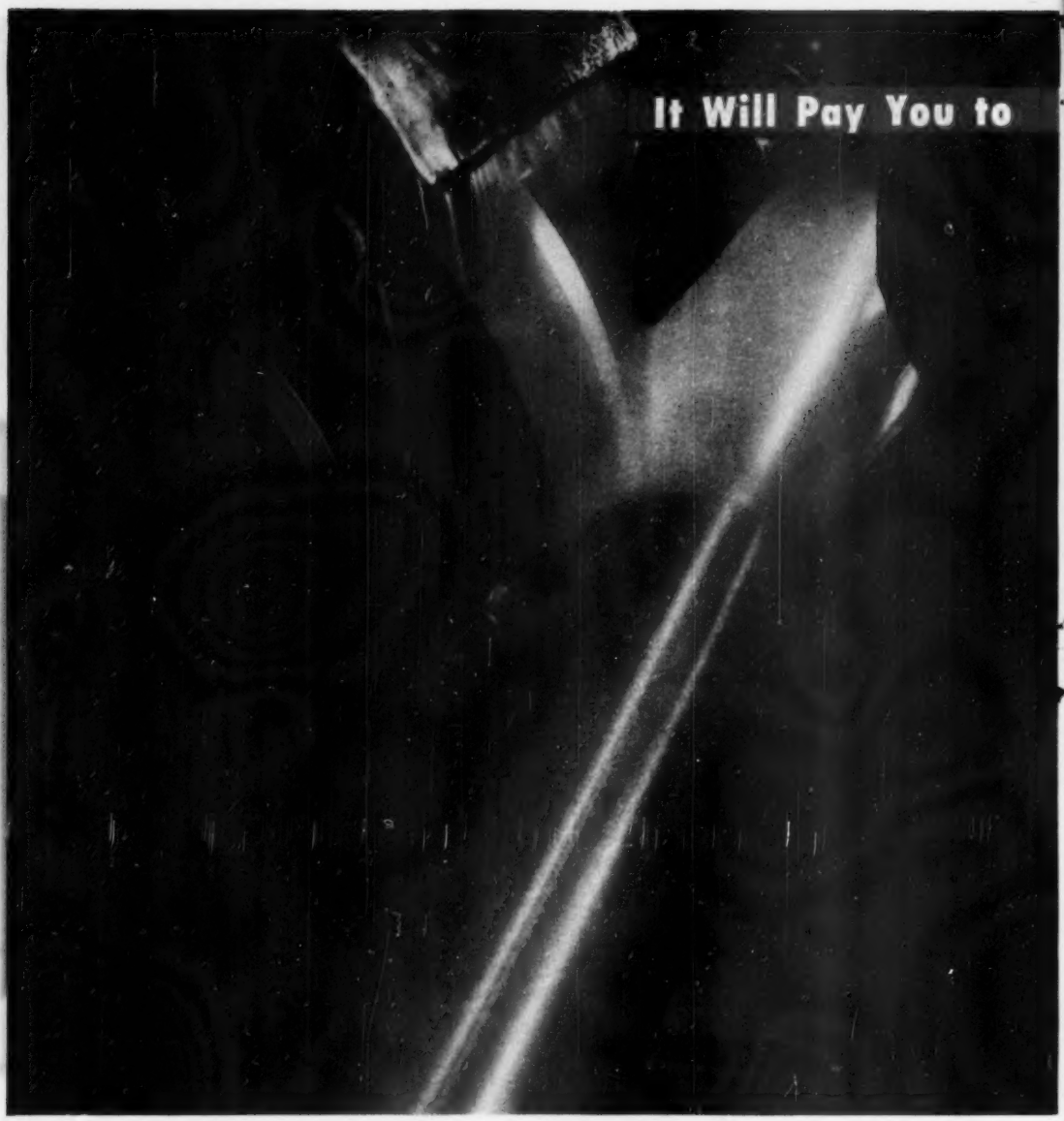
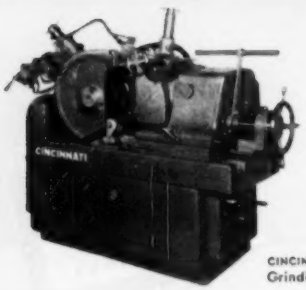
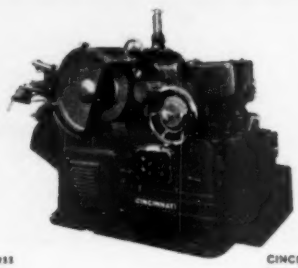




CINCINNATI FILMATIC No. 2 Centerless Grinding Machine; catalog No. G-591.

REPLACE WITH A NEW CINCINNATI



CINCINNATI FILMATIC No. 3 Centerless Grinding Machine; catalog No. G-570-1.

CIN

Check these ABCs

CINCINNATI FILMATIC

For Your Bar Grinding Replacement Program

Equipment takes a beating from long bar centerless grinding operations. It's a good idea to check the machine and fixture more often than usual; find out if they are anemic defenders in your replacement formula. When new equipment is economically justified, your best choice is CINCINNATI No. 2 or 3 Centerless. There are several reasons why . . . FILMATIC bearings, for one. In addition to the perpetual youth of these bearings, they require no adjustment for rate of metal removal or quality of finish. Other features of value in bar grinding include fixed grinding wheel heads and hydraulic profile truing. To these desirable advantages offered by the machine, add a choice of four Long Bar Grinding Fixtures:

Type A—for comparatively short bars; capacity ⅛" to 1¼" diameter, lengths up to 2½ feet. Nos. 2 and 3 machines.

Type B—for medium diameter, medium length bars; capacity ⅛" to 1¼" diameter, lengths up to 8 feet. Nos. 2 and 3 machines.

Type C—for long, medium diameter bars; capacity ½" to 2" diameters, lengths up to 18 feet. Nos. 2 and 3 machines.

Type D—for long, large diameter bars; capacity 1" to 4" diameters, lengths up to 18 feet. With auxiliary equipment, additional capacity includes bars ⅛" to 1" diameter up to 8 feet long. No. 3 machine only.

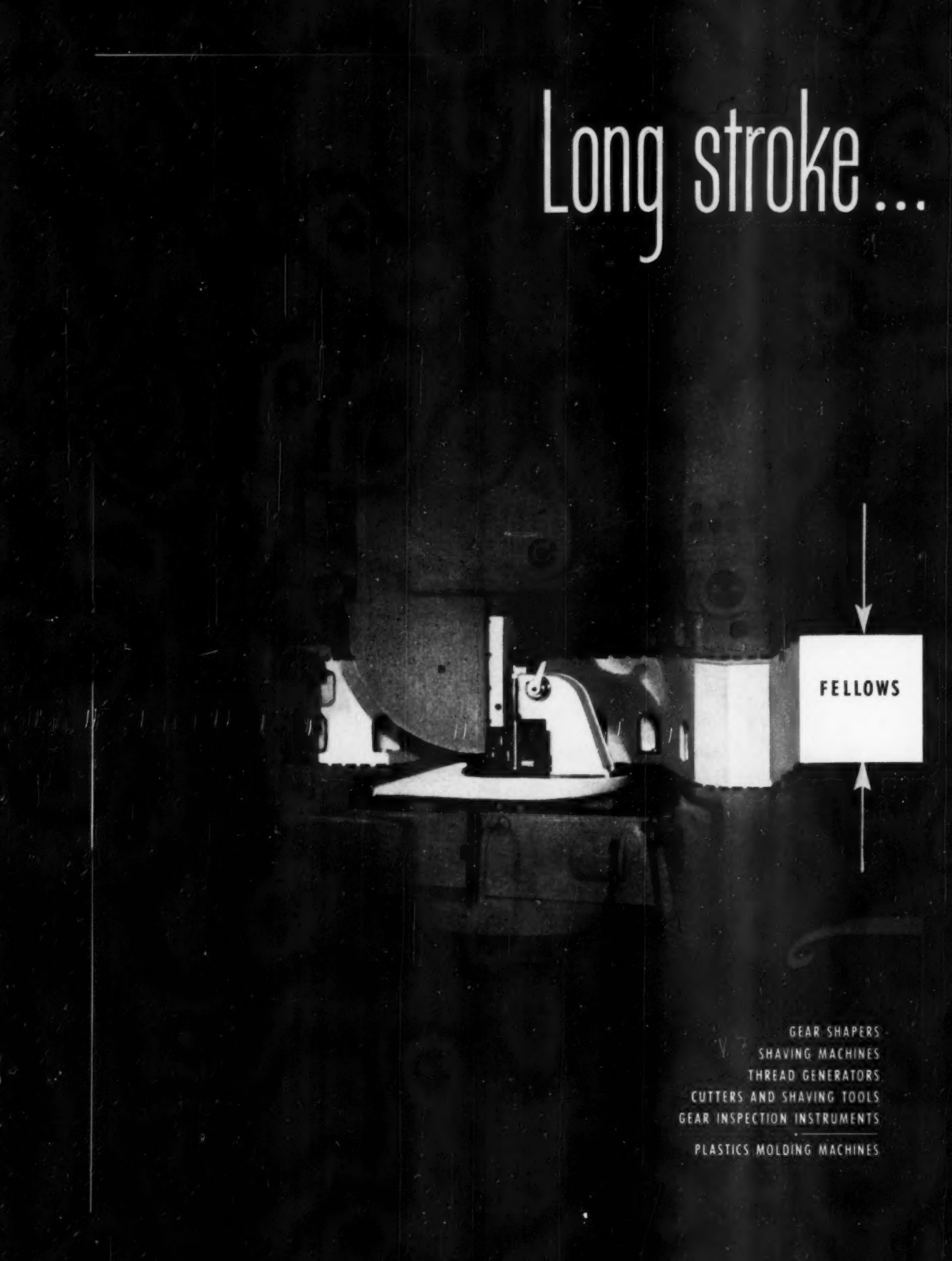
These fixtures are equally advantageous in grinding steel and nonmetallic bars, tubes and rods. More information may be obtained by writing for literature: CINCINNATI FILMATIC No. 2 Centerless, G-591; No. 3 Centerless, G-570-1.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

Long stroke...



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

...ADAPTABILITY

invites imaginative use of the

No. 36 GEAR SHAPER

Basic design is such that this machine readily accommodates a raised section to lengthen the normal 6-inch cutter stroke to 13 inches. Cutters can then be provided to produce any desired contour, such as on the slim parts shown here. The controlled precision inherent in the Fellows Cutter, and the ease of sharpening, makes possible the economical production of generated shapes to close tolerances, indefinitely.

DESIGN MODIFICATION PROVIDES

A Case in Point:

These five different 12.125" long cylindrical cam parts for the I.B.M. Alpha Calculating Machine require concentricity of the lobe radii to within 0.002" full indicator reading at all points. On the Gear Shaper accuracy is assured. Cutting time is minimized. Loading is simple, quick and easy.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department, 78 River Street, Springfield, Vermont, U.S.A.
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VAN NORMAN RAM TYPE Help You

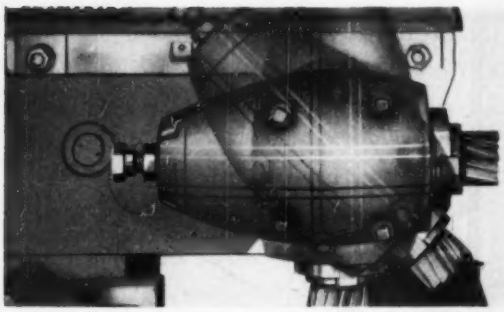
Look at the Versatility...
one machine does the work of several millers

No. 26
RAM-TYPE MILLER

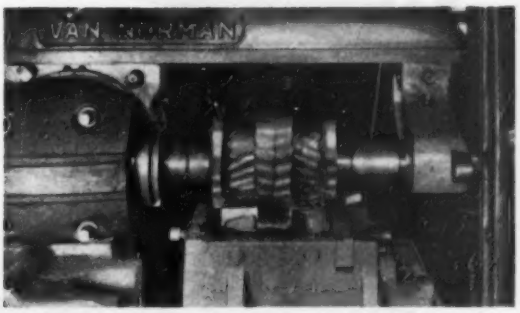
VAN NORMAN

MILLERS Cut High Production Costs

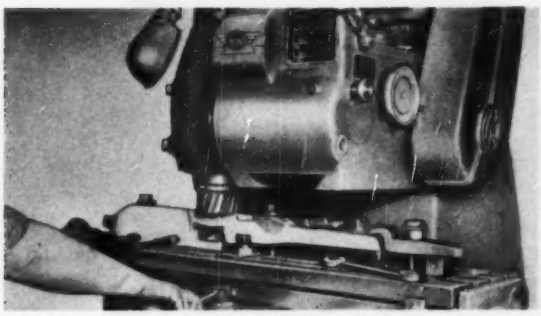
BY REDUCING IDLE MACHINE TIME



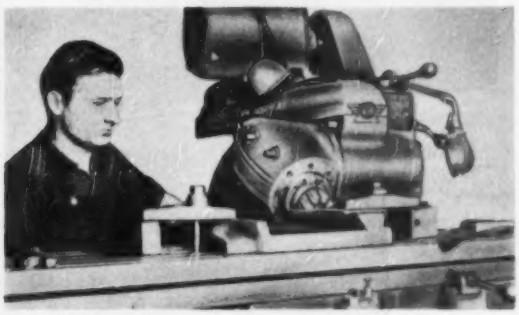
Adjustable Cutterhead permits horizontal, angular or vertical milling on **one** miller. This versatility is equal to several single purpose machines.



Horizontal Milling — Simply lock head in horizontal position and you're ready for horizontal milling. Ram-type overarm and outer support assures rigidity and accuracy.



Vertical Milling — With the cutterhead in vertical position, the operator is taking a vertical cut on the work piece.



Angular Milling — Lock the cutterhead in any desired angular position and you're ready for angular milling. Graduated dial in degrees makes positioning easy.

VAN NORMAN RAM TYPE MILLERS give you every advantage in reducing milling costs. The adjustable cutterhead reduces idle machine time to an absolute minimum. It permits one machine to perform horizontal, angular or vertical milling. There is no waiting for single purpose millers because practically all milling operations can be accomplished on the Van Norman Ram Type Miller. In addition, work setups are reduced and the operator gets out more work.

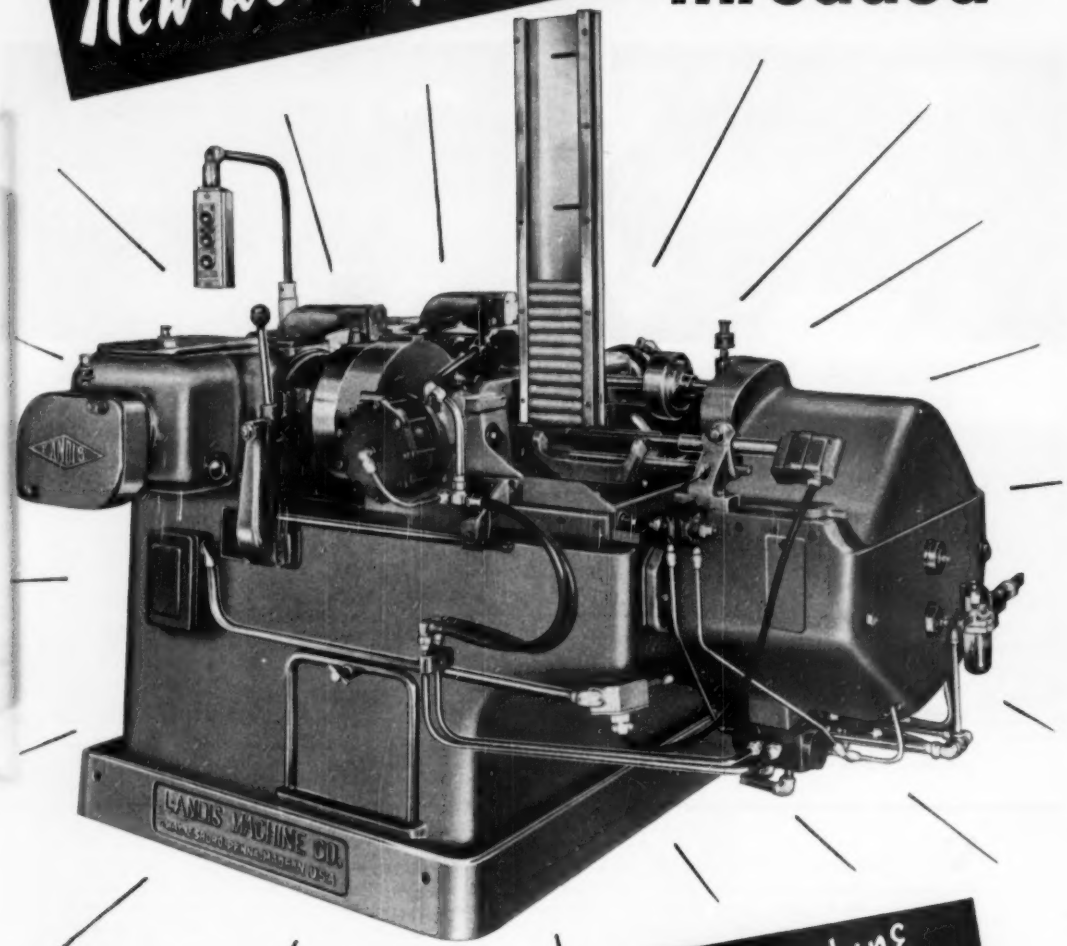
Van Norman Ram Type Millers are easy to operate. Front and rear controls permit operation from either location. Hardened and ground steel fixed cutterhead stops permit true settings at horizontal or vertical position. The rugged construction throughout assures accuracy and long life.

Investigate Van Norman Ram Type Milling Machines for toolroom, laboratory, pattern and die work, job shop or production milling. Available with plain or universal saddles in a wide range of sizes. Write:

COMPANY, SPRINGFIELD, MASS., U.S.A.

Revolutionary New Development

CLOSE threaded



THE WORLD'S

LANDIS Machine COMPANY

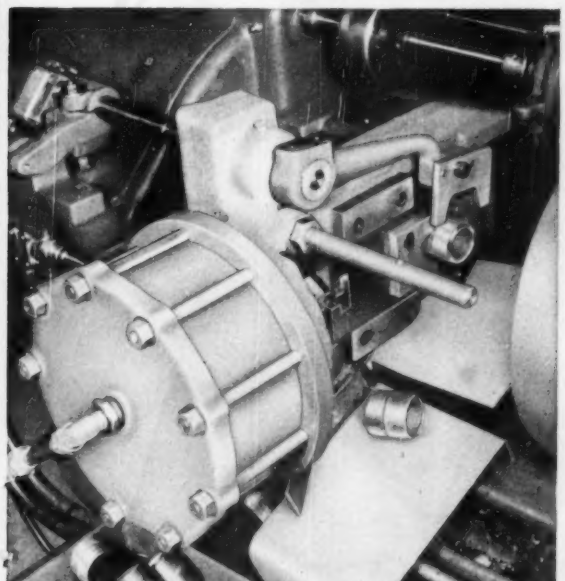
WAYNESBORO • PENNA.

& SHORT NIPPLES

in one automatic operation...

Formerly the production of close and short nipples was featured by high labor cost, low output and tedious manual handling. NOW . . . here is a modern machine tool which mass-produces these nipples in a single continuous automatic operation.

The LANDIS Automatic Close Nipple Threading Machine, recently perfected by Landis Thread Engineers, will produce commercial standard close, short, and special short nipples at rates ranging up to 625 per hour. These machines are built in two size ranges—one for ½" to ¾" nipples—the other for 1" to 2" nipples.



This new LANDIS Close Nipple Machine is completely automatic—threading, reaming, and chamfering close nipples on both ends without secondary manual handling. Nipple blanks are fed from a magazine, transferred automatically from one carriage to the other, and ejected when finished.

Tremendous savings in labor cost can be realized —PLUS other savings through lower tool cost and increased production. The operator is required only to fill the magazine and give supervisory attention. Thus a SINGLE operator can handle TWO or THREE LANDIS Close Nipple Machines, depending on the pipe size.

New construction features contribute to longer life and more efficient operation. Special built-in safety devices guard against damage from jams and ease the supervisory job of the operator. Write today for complete information and specifications.

LANDIS

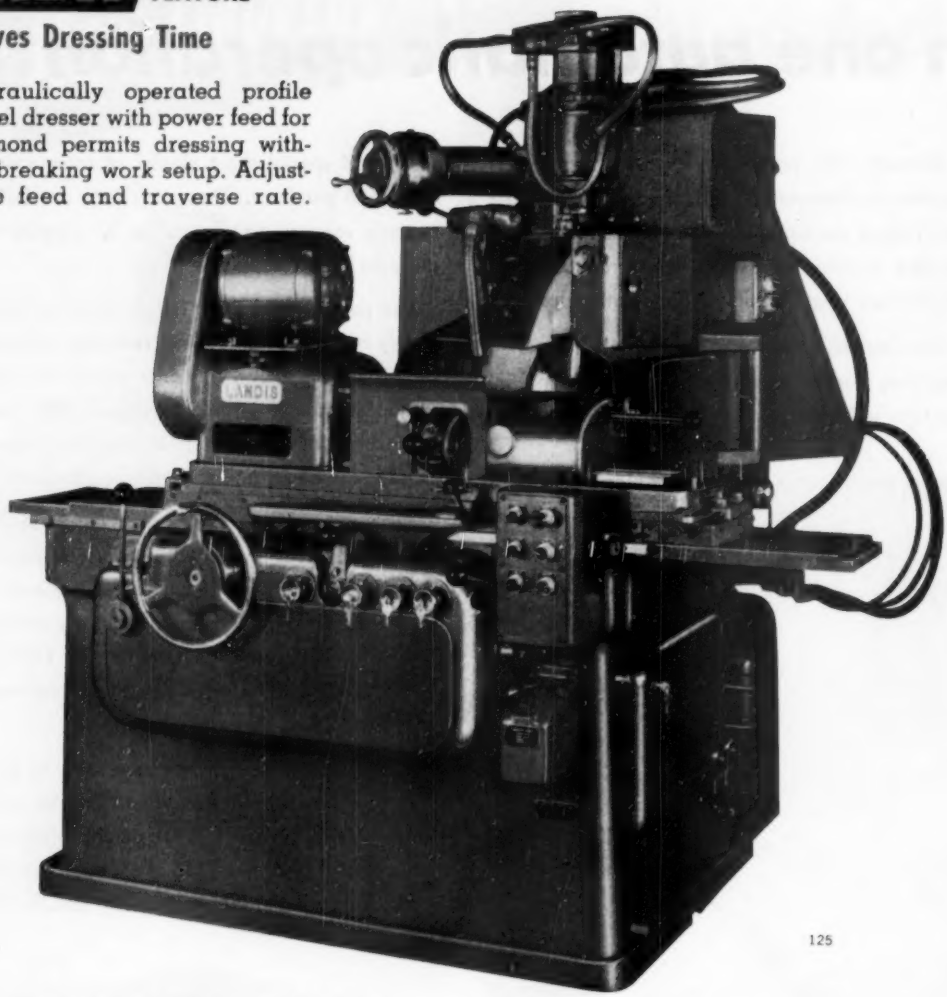
LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

Reduce Precision Grinding Costs by

NEW FEATURE

Saves Dressing Time

Hydraulically operated profile wheel dresser with power feed for diamond permits dressing without breaking work setup. Adjustable feed and traverse rate.



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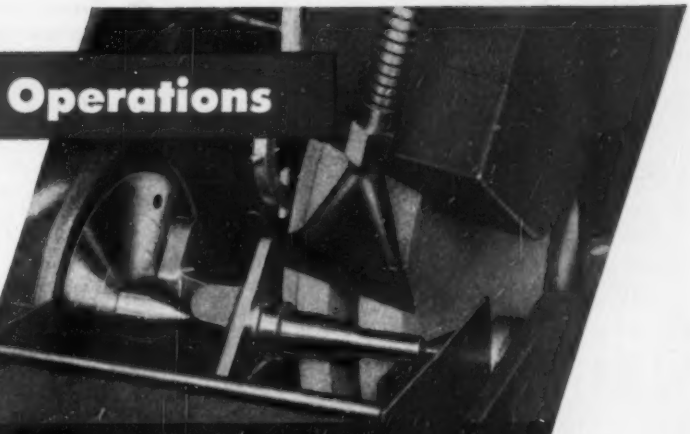
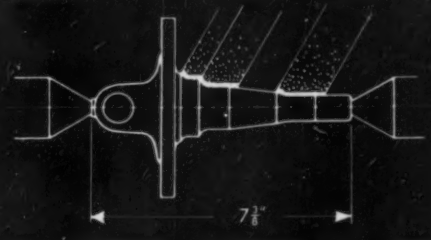
LANDIS TOOL
Precision Grinders

Type CH Plain Cylindrical Grinder with wheel base set at 30° angle. Grinds face and diameters in one operation.

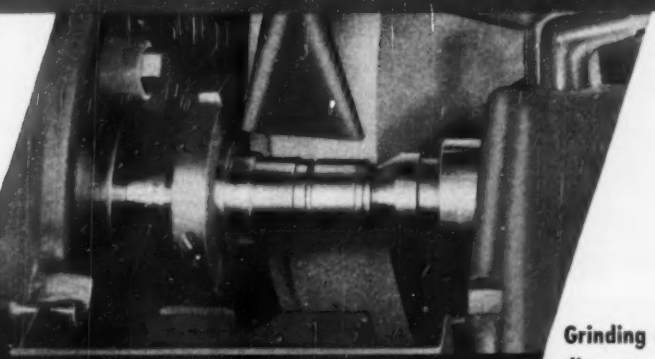
Combining Operations



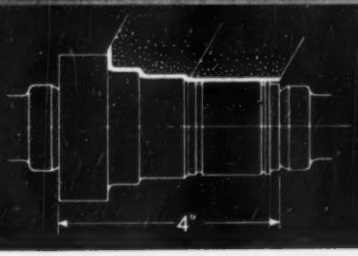
Grinding 3 diameters and 3 blending radii in one operation.



with Angle Wheel Base Grinder



Grinding a face and 3 diameters in one operation.



Production estimates and tooling suggestions made without obligation if blueprints are submitted of work pieces.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

G&L PRODUCTION FACTS

on a typical job

1 Eight Hours Production Time Saved

2 Accuracy Improved

3 Two Set-Ups Eliminated

4 Layout Eliminated

5 Two Machines Replaced

1 Present floor-to-floor machining time on this cast semi-steel housing is 9½ hours. Formerly the same job on a vertical lathe and drilling machine required 17½ hours. The G. & L. Horizontal Boring Machine saves eight hours on each casting machined.

2 Two set-ups were required to face and bore this casting on a vertical lathe. The housing is now mounted on a plate or base which in turn is clamped to the horizontal boring machine table. Instead of unclamping the work, the part and base is turned 180° for facing and boring operations.

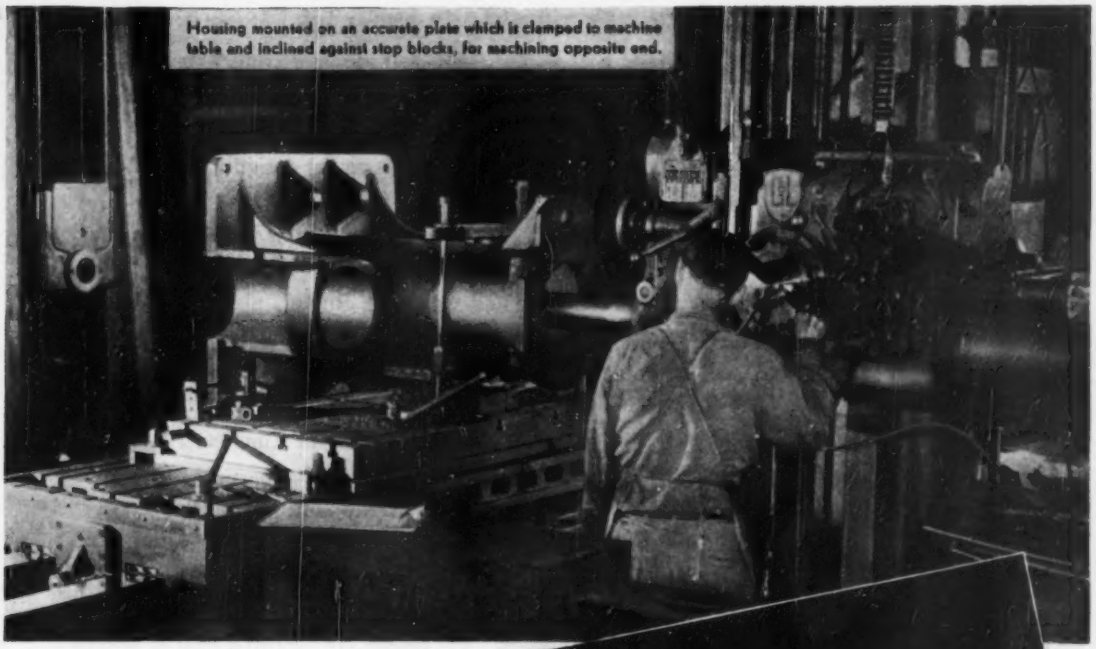
3 Because all boring, milling, drilling and tapping operations are completed before the work is unclamped, overall accuracy is greatly improved. Bored and drilled holes and milled surfaces are always in correct alignment with each other.

Eight hours saved in machining this semi-steel housing.

4 Layout is not required before the casting comes to the machine. All holes are drilled using the machine scales and verniers for correct hole location. Drilling and tapping operations are simplified.

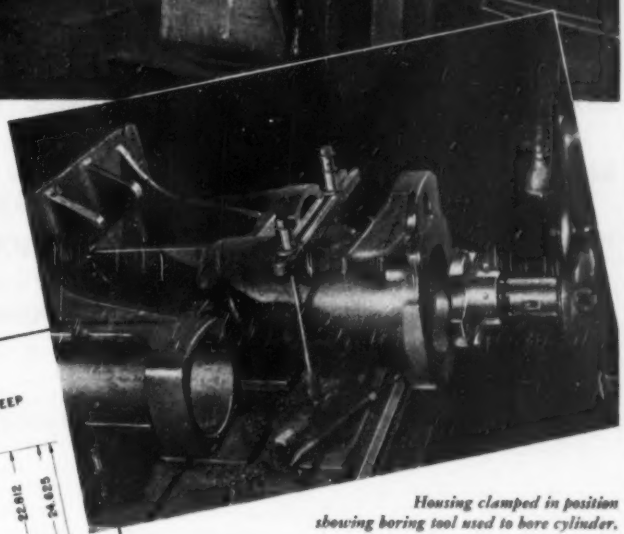
5 The G. & L. Horizontal Boring Machine replaced a vertical lathe and a drill press. Production was increased and machining costs were reduced for unnecessary work handling was eliminated. Drilling and tapping operations are performed on the horizontal mill without disturbing original work setting.

GIDDINGS & LEWIS
FOND DU LAC

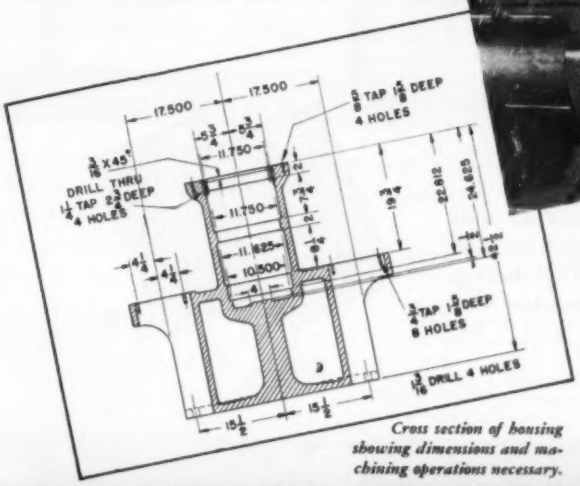


Housing mounted on an accurate plate which is clamped to machine table and inclined against stop blocks, for machining opposite end.

Now is the time to analyze your own production methods. You may be able to make similar savings with the G. & L. Horizontal Boring Machine. Our staff of experienced engineers will be glad to help you with your machining problems. There is no obligation for this service, merely submit the problem.



Housing clamped in position showing boring tool used to bore cylinder.



Cross section of housing showing dimensions and machining operations necessary.

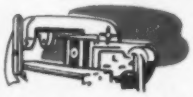
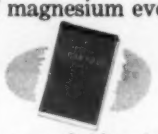
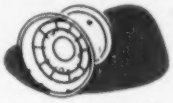
ADDITIONAL DATA

. . . covering the complete line of Giddings & Lewis machines and time saving accessories is included in this catalog. Write for your copy today — please indicate your business connection.

MACHINE TOOL COMPANY

WISCONSIN U. S. A.

Hog Tied

This young designer got hot on a big job . . . landing gear wheels for a new bomber contract. Make 'em stronger. Make 'em lighter. Magnesium seemed a natural. But his plan was hog tied by the boss till he could prove how easy magnesium is to handle. So he checked light-metal headquarters, Aluminum Company of America. He learned the common-sense practices and easy techniques of handling magnesium.  (Manufacturers, nationwide, use over a million pounds of magnesium every month.) Free books on designing and fabricating magnesium  showed that it weighs less and machines faster than any commercial metal. So one of Alcoa's modern foundries now casts these wheels  at an attractive price. Result! Weight saved. Machining costs down. The magnesium wheels meet all strength specs. And the young designer is becoming a big wheel, himself.

These two free books on magnesium and our broad technical experience can help your products, too. Write Aluminum Company of America, 2106H Gulf Building, Pittsburgh 19, Pa. Sales offices in principal cities.

ALCOA

ALCOA ALUMINUM and MAGNESIUM

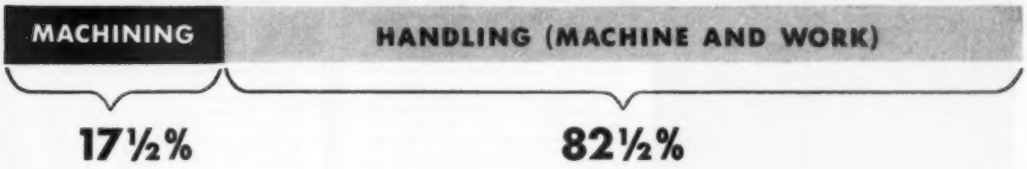
...getting down to brass ~~tacks~~ *parts* on costs!

❶ HERE'S HOW A BRASS PART IS MADE IN MOST SHOPS*

*Bar graph represents an average of 68 different job studies.

C' DRILL
DRILL & C' BORE
TURN & CHAMFER
TAP
THREAD
FACE SEAT
LOAD START SPINDLE ADVANCE TOOL
WITHDRAW TOOL INDEX ADVANCE TOOL
WITHDRAW TOOL INDEX ADVANCE TOOL
WITHDRAW TOOL INDEX ADVANCE TOOL
REVERSE SPINDLE WITHDRAW TAP INDEX REVERSE SPINDLE ADVANCE DIE HEAD
REVERSE SPINDLE WITHDRAW DIE HEAD INDEX REVERSE SPINDLE ADVANCE TOOL
WITHDRAW TOOL INDEX STOP SPINDLE UNLOAD

❷ LET'S SEPARATE MACHINING TIME FROM HANDLING TIME, LIKE THIS:

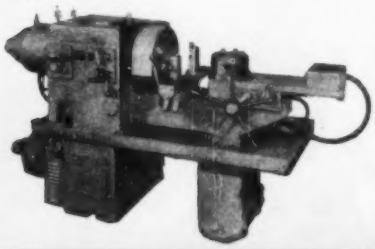


❸ HOW YOU CAN INCREASE PRODUCTION:

If any *substantial* time savings are to be made, they must come out of the 82½% field—time consumed wholly in machine and work handling.

And that's where a Warner & Swasey Electro-Cycle fits in.

The Electro-Cycle automatically takes over so much of the machine handling part of a job, your operators can produce more finished pieces per hour—and do it with much less manual effort. Production increases of 40 to 60% are common when brass jobs are put on an Electro-Cycle.



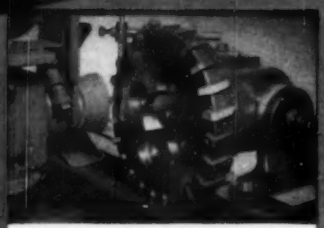
Find out what an Electro-Cycle can do on *your* jobs—to get a close estimate of how much it can increase production to reduce your costs, call your nearest Warner & Swasey Field Representative, or write—

Warner & Swasey Sells One Thing . . . Increased Production

WARNER & SWASEY Machine Tools *Cleveland*

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

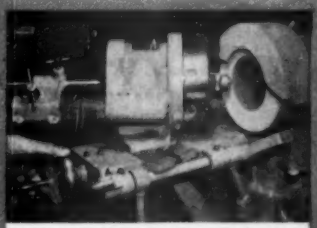
. . . Because-
There's a Cost-Cutting



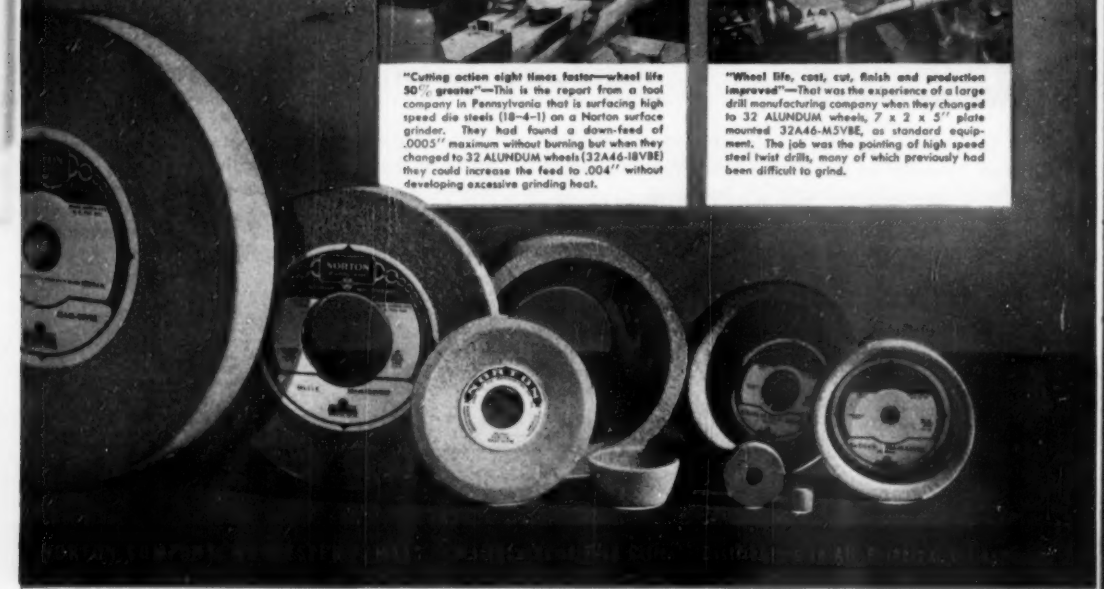
"Faster and cooler cutting than previous wheels"—That is the report of a large mid-western manufacturer on the performance of 5/ 3¾ x 1⅜ x 1¼" 32 ALUNDUM wheels, tapered cup shape 32A46-K5VBE, in sharpening large multi-tooth cutters. Another cost cutting feature is the fact that it is not necessary to dress the 32 ALUNDUM wheels as frequently as the previous types of wheels.

"Grind better than 1250 sets per wheel"—Wheel life went up considerably for a Massachusetts manufacturer when he changed to 32 ALUNDUM wheels, 12 x 2½ x 7", cup shape 32A46-L5VBE, for grinding the lead and rake angles on thread chasers on his Landis machines. The 32 ALUNDUM wheels give a good commercial finish and show no burn at all.

"Cutting action eight times faster—wheel life 50% greater"—This is the report from a tool company in Pennsylvania that is surfacing high speed die steels (18–4–1) on a Norton surface grinder. They had found a down-feed of .0005" maximum without burning but when they changed to 32 ALUNDUM wheels (32A46-I8VBE) they could increase the feed to .004" without developing excessive grinding heat.



"Wheel life, cost, cut, finish and production improved"—That was the experience of a large drill manufacturing company when they changed to 32 ALUNDUM wheels, 7 x 2 x 5" plate mounted 32A46-M5VBE, as standard equipment. The job was the pointing of high speed steel twist drills, many of which previously had been difficult to grind.



Norton Wheel for Every Tool Room Job

32 ALUNDUM Abrasive—

This sensational abrasive—new and exclusively Norton—is making outstanding records everywhere. In thousands of tool rooms they are finding that "32" wheels can make substantial savings on all types of sharpening operations on high speed steels. Its unique crystal structure gives grains that are *sharper*—they penetrate sensitive high speed steels more easily, cutting faster and cooler.

38 ALUNDUM Abrasive—

The original white abrasive, "38" has been a tool room favorite for forty years and is still popular with many tool grinders. It is the recommended abrasive for sharpening jobs where feeds are very light.

57 ALUNDUM Abrasive—

One of the newer Norton abrasives, "57" combines a fast cutting action with great toughness. Thus it is widely used for offhand tool grinding operations. Its slightly lower price also makes it popular for precision sharpening jobs in shops where the first cost of the wheel is given major consideration.

It's really no trick to save money in your tool room if you have the right Norton wheels—wheels carefully selected to meet the exact requirements of each of your tool grinding jobs. Your Norton abrasive engineer or your Norton distributor will be glad to help in that selection job. You'll find a lot of helpful information in the Norton handbook on tool room grinding. Send for a copy—just ask for Form 835-A4.

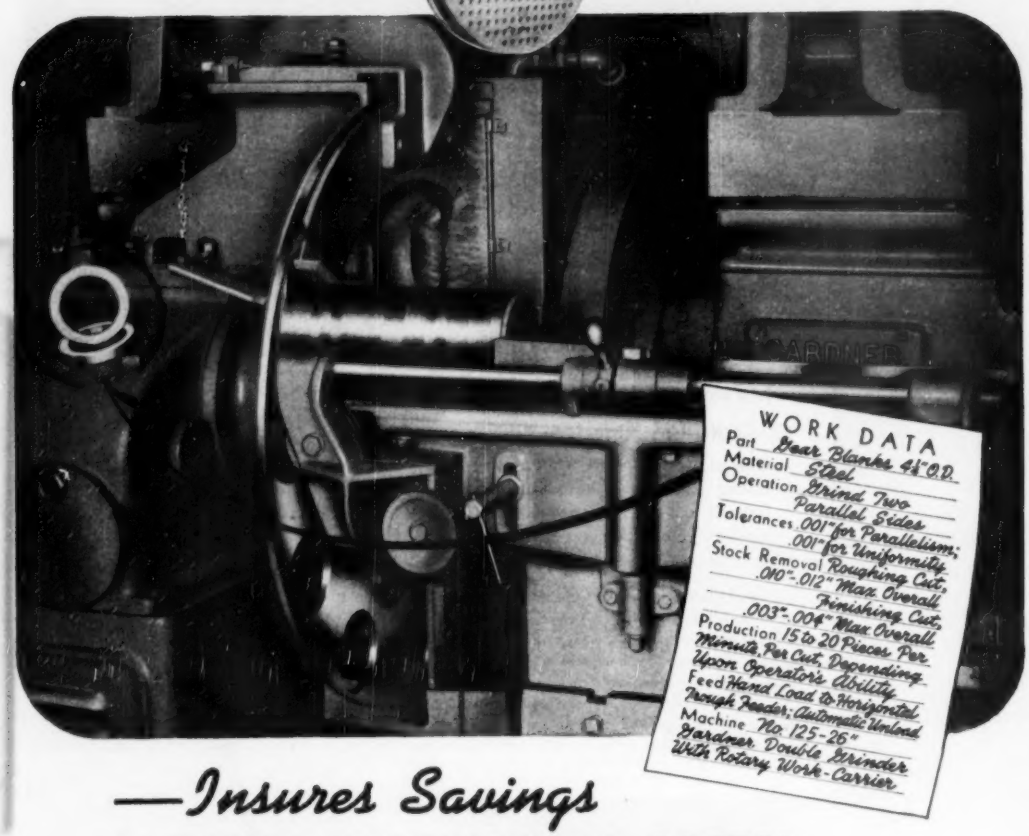
NORTON
ABRASIVES

You Can Cut Tool Room Costs, too, with the NORBIDE Dressing Stick

Tool rooms are reporting savings up to 50% in dresser costs with NORBIDE Dressing Sticks. Because these sticks are light and easy-to-use, operators keep tool wheels in better condition.

Making better abrasives

Double GARDNER-GRINDING —


WORK DATA
Part Gear Blanks 4½" O.D.
Material Steel
Operation Grind Two Parallel Sides
Tolerances .001" for Parallelism; .001" for Uniformity
Stock Removal Roughing Cut, .010"-.012" Max. Overall
Finishing Cut, .003"-.004" Max. Overall
Production 15 to 20 Pieces Per Minute, Per Cut, Depending Upon Operator's Ability
Feed Hand Load to Horizontal Trough Feeder; Automatic Unload
Machine No. 125-26" Gardner Double Grinder With Rotary Work-Carrier

—Insures Savings in YOUR PRODUCTION COSTS!

PRODUCTION short-cuts are a "cinch" when BOTH sides of a piece are ground in ONE pass through a Gardner DOUBLE Grinder. This No. 125-26" unit is parallel-surface grinding both sides of steel automotive Gear Blanks at 15 to 20 pieces per minute . . . and maintaining close tolerances, too! (See Work Data above).

Let us show you how a Gardner Grinder can be the answer to your parallel-surfacing problems.

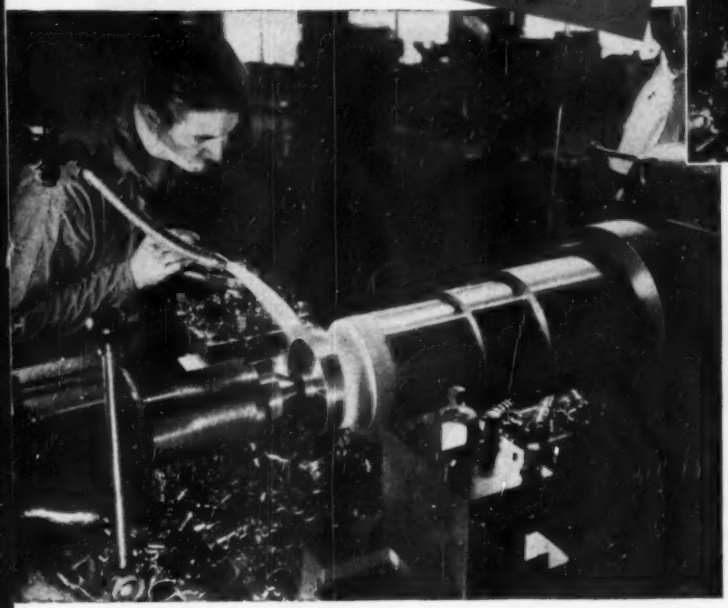
Ask for our DOUBLE-GRINDING Bulletin!

GARDNER MACHINE COMPANY

410 EAST GARDNER STREET . . . . BELOIT, WISCONSIN, U.S.A.

40 H.P. CUT

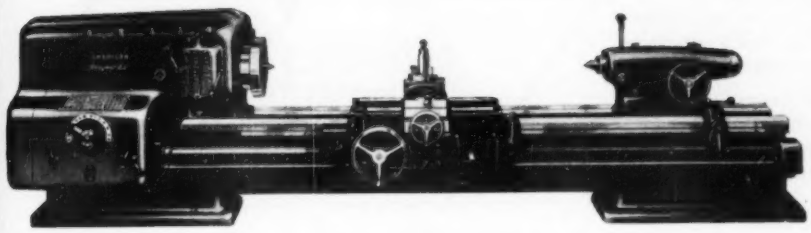
on Main Pin Forgings



The new 25-inch "AMERICAN" Pacemaker Lathe powered with a 40 horse power driving motor is here shown machining Locomotive Main Pins from rough forgings. The cut being taken consumes 40 horse power and the time for the job is 30 minutes, floor to floor.

This is just a sample of what this new lathe will do. It is tremendously powerful and rugged and yet its ease of operation is amazing—finger tip control best describes it. It has speeds for both high speed steel and cemented carbide tools, a wide range of threads and feeds and a massive bed designed for chip disposal at the rear.

For machining axles this new lathe equipped with "AMERICAN" Hydraulic Duplicator is the latest contribution to lower axle costs.



Send for descriptive Bulletin No. 23-A.

THE AMERICAN TOOL WORKS CO.

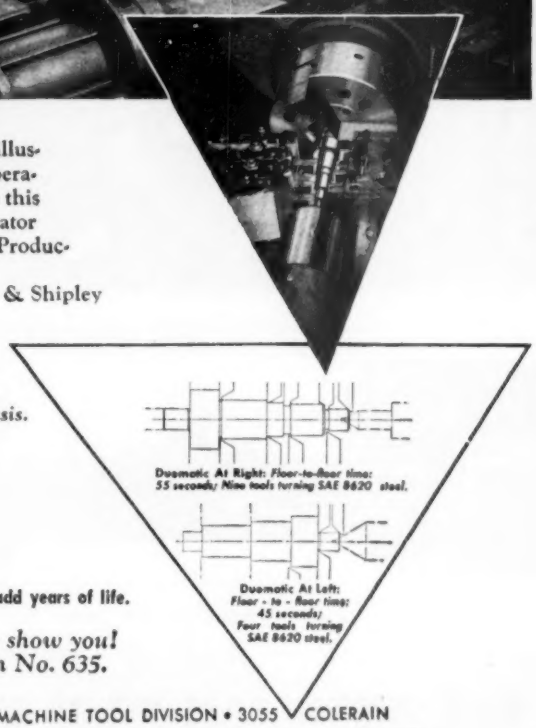
Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

LODGE & SHIPLEY Duomatic productivity is illustrated in this typical automotive set-up. The operator starts the first Duomatic on its cycle. While this machine operates automatically, the same operator easily handles a cycle on the other Duomatic. Production *flows* from both 2A Duomatics!

The low-cost, precision production of Lodge & Shipley 2A Duomatics is a valuable weapon in the fight against mounting costs. Are *your* lathes operating profitably? Lathes only a few years old may be badly outmoded when compared with new Duomatics *on a productive basis.*

- ★ **Turn and bore with front and rear tool slides.**
- ★ **Swivel tool slides for angular facing and turning.**
- ★ **Simplicity of set-up reduces set-up time.**
- ★ **NO CAMS REQUIRED for automatic cycle.**
- ★ **Ideal for long or short runs.**
- ★ **Easily handled by unskilled operator.**
- ★ **New hardened steel bedways and cross slide ways—add years of life.**


Duomatic At Right: Floor-to-floor time: 55 seconds; Nine tools turning SAE 8620 steel.
Duomatic At Left: Floor - to - floor time: 45 seconds; Four tools turning SAE 8620 steel.

Let a Lodge & Shipley Representative show you!
Write for 2A Duomatic Bulletin No. 635.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

HYSTER DEALERS *Everywhere*

SELL AND SERVICE THE MOST COMPLETE LINE OF INDUSTRIAL TRUCKS ON THE MARKET

HYSTER
LIFT TRUCKS
STRADDLE TRUCKS
MOBILE CRANE

HYSTER 20
Capacity — 2000 pounds
Width — 37 inches
Length — 71 inches (less forks)

HYSTER 40
Capacity — 4000 pounds
Width — 42 inches
Length — 86 inches (less forks)

HYSTER 75
Capacity — 7500 pounds
Width — 60 inches
Length — 117½ inches (less forks)

HYSTER 150
Capacity — 15,000 pounds
Width — 86 inches
Length — 148 inches (less forks)

M STRADDLE TRUCK
Capacity — 18,000 pounds
Width — 78½ in. and 90½ in.
Length — 176 inches

MH STRADDLE TRUCK
Capacity — 30,000 pounds
Width — 90 in. and 100 in.
Length — 190½ inches

KARRY KRANE
Capacity — 10,000 pounds
Width — 75 inches
Length — 132 inches

...and now
HYSTER
Salsbury
Turret
Trucks

PALLET TRUCK
Capacity — 4000 pounds
Width — 35 inches
Length — 86 in. and 110 in.
Height — 55 inches

TUG
Towing capacity — 20,000 pounds
Width — 42 inches
Length — 62 inches
Height — 58 inches

PLATFORM TRUCK
Capacity — 4000 pounds
Width — 35 inches
Length — 97 in. and 115 in.
Height — 50 inches

CARGO TRUCK
Capacity — 4000 pounds
Width — 42 inches
Length — 103½ inches
Height — 58 inches

AUTO-LOADER
Width — 20 inches
Length — 135 inches
Height — 80 inches

Hyster dealers are located in 37 principal U. S. cities, and in 57 foreign countries. These men and their organizations sell — and more important — service the most complete line of industrial lift trucks, attachments and accessories, on the market today.

Phone your Hyster dealer for demonstration and list of owners. Or use the coupon for literature.

HYSTER® COMPANY

THREE FACTORIES

2902-14 N. E. CLACKAMAS, PORTLAND 8, OREGON
1802-14 NORTH ADAMS ST., PEORIA 1, ILLINOIS
1010-14 MEYERS STREET... DANVILLE, ILLINOIS

HYSTER COMPANY, 2902-14 N. E. CLACKAMAS, PORTLAND 8, OREGON

Please mail Hyster catalogs as checked . . . . .

☐ 20 ☐ 40 ☐ 75 ☐ 150
☐ M ☐ MH1 ☐ MK ☐ Turret

FIRM NAME _____
MY NAME _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

ARMSTRONG

Modern Tooling Calls for *the Correct*

ARMSTRONG TOOL HOLDERS

for each operation

In the old days it was a matter of pride with toolmakers to be able to do the work at hand with the tools at hand. It's a credit to their skill that they could devise to cut threads, do cutting-off and facing, as well as many other operations with one ARMSTRONG TURNING TOOL, but, at today's labor cost, this would be an expensive practice. The maximum of productive work and true machining efficiency can only be obtained by providing the correct ARMSTRONG TOOL HOLDERS for each operation.

The Armstrong System of Tool Holders provides specially designed ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters, and shapers . . . Turning Tools, Boring Tools, Threading Tools, Knurling Tools, Cutting-Off Tools; tool holders with straight shanks, with off-set shanks, rigid tools and "spring" tools . . . special tool holders for high speed steel bits or blades, for ARMIDE (carbide-tipped) Cutters, for ARMALOY (cast alloy) Bits and Blades.

These modern efficient ARMSTRONG TOOL HOLDERS are as available as your telephone for they are carried in stock by your local ARMSTRONG Distributor.

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. ARMSTRONG AVENUE **CHICAGO 30, ILL.**

Gates
REG. U. S. PAT. OFF.

Achieves the long-sought V-BELT DRIVE for LOOMS

For Cotton Mills and Rayon Mills

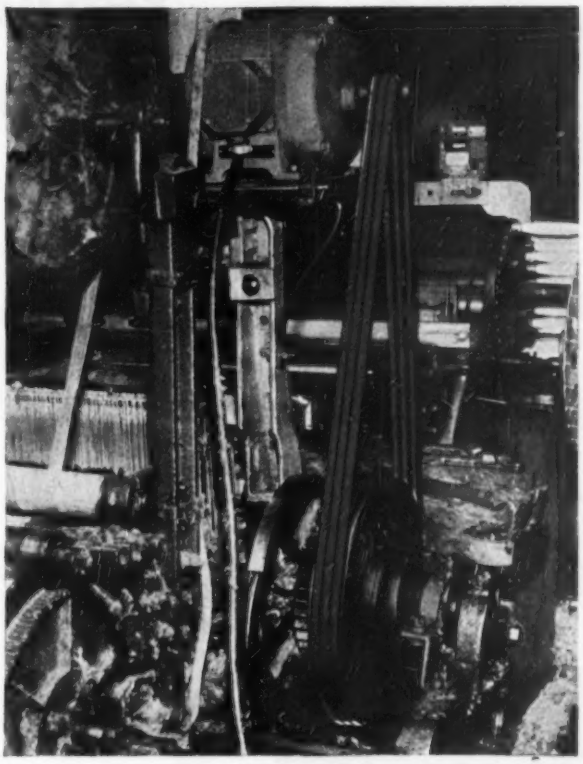
Loom operators had long *wanted* a V-Belt Drive for their looms. *But*—

Stubborn Difficulties

—stood in the way. Gates over-came these difficulties through *SPECIALIZED* research in the world's largest V-Belt testing laboratories, thus providing—

Another Accomplishment For Industry

by Gates *SPECIALIZED* Research



THE extremely small diameter of pulleys over which loom drive V-Belts must flex under severe shock-loads posed a problem in V-Belt construction that seemed *insurmountable.*

But, with war-born synthetic fibers of unusual strength; and with man-made rubbers possessing engineering properties never available before—and with the great research and testing facilities available at Gates—a V-Belt was achieved that met the rigorous conditions of loom drive operation.

Then, a clutch of very advanced design was wanted—a clutch that would do *more,* with *less* maintenance, and *fewer* troublesome adjustments than the clutches commonly used with gear and pinion drives on looms.

Gates therefore engineered a clutch that is a marked improvement over the clutches previously available for looms.

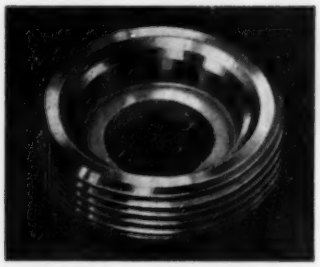
Finally—and this was most important, too—the entire drive assembly had to be so designed that it would go on the loom without any costly re-arrangement of existing mill equipment. This rather demanding job of design was also accomplished.

Today, the Gates V-Belt Drive for looms is cutting operating costs—and giving bigger loom output with better quality of cloth—in Cotton Mills and Rayon Mills the country over—another accomplishment of Gates *SPECIALIZED* Research!

ENG-505

THE GATES RUBBER COMPANY
The World's Largest Makers of V-Belts
DENVER, U.S.A.

GATES VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 11 Foreign Countries



here is PROOF that you can reduce unit costs by using *Carpenter* Free-Machining Stainless

1 **UNIT COST GOES DOWN!**

At first this bearing race job was classed as "impossible"—slow production, excessive rejects and a high unit cost. But now that Carpenter Stainless No. 8 (Type 303) is on the job, *each unit costs only five cents, tool life has doubled and rejects have dropped by 40%.*

2 **SAVED: $456.00 EACH YEAR ON TOOL REGRINDING!**

The cost of each Stainless part is bound to come down when you make a saving like that. *Tool life jumped from a few hours to over 15 days, plus the fact that less down time on machines gave the company production time for over 23,000 extra valve needles per year.* Small wonder that the company is pleased with Carpenter Stainless No. 8 (Type 303).

To get results like these time after time, the Stainless that feeds into your machines has to be *uniform* from bar to bar. It has to work the same in your machines month after month. And that is just why you need Carpenter Free-Machining Stainless on your jobs.

If you want positive proof that you can reduce your unit costs with *consistently uniform* Carpenter Free-Machining Stainless bar stock—do this. Place your next production order with the nearest Carpenter warehouse listed below. Send your order to Carpenter and find out for yourself that—

YOU CAN TURN IT OUT AT LESS COST
WITH *Carpenter* FREE-MACHINING STAINLESS

"Big Help to Getting More Parts From Every Pound of Stainless" . . .

That is what customers say about the Carpenter "NOTEBOOK on Machining Stainless Steels" with its 96 pages of useful information on Turning, Drilling, Tapping, Threading, etc. For your copy, just drop us a note on your company letterhead. Extra copies of the NOTEBOOK, for the men in your plant, are available at 50¢ each.

3 **PRODUCTION UP 25%!**

The Plant Manager told us that he has tried many Stainless Steels, and is convinced that Carpenter Stainless No. 5 provides the best finishes and *machines 25% faster than competitive materials.*

THE CARPENTER STEEL COMPANY, 109 West Bern Street, Reading, Pa.

Export Department: 233 Broadway, New York 7, N.Y. "CARSTEELCO"

Carpenter

FREE-MACHINING

STAINLESS STEELS

When You Want *Rush* Delivery Call Your *Carpenter* Warehouse—

BOSTON	CINCINNATI	HARTFORD	PHILADELPHIA
BRIDGEPORT, CONN.	CLEVELAND	INDIANAPOLIS	PROVIDENCE
BUFFALO	DAYTON	LOS ANGELES	ST. LOUIS
CHICAGO	DETROIT	NEW YORK	WORCESTER, MASS.

SEE YOUR CLASSIFIED TELEPHONE DIRECTORY

install LINK-BELT Ball and Roller Bearings and . . . *let 'em roll . . .*

They are pre-lubricated

All Link-Belt solid housing bearing blocks are pre-lubricated with high-grade lubricant at assembly, and are ready for operation.

They have a large grease reservoir

Re-lubrication is necessary only at long intervals. The large grease reservoir, sealed against lubricant loss and dirt entry, contributes to long life and efficiency.

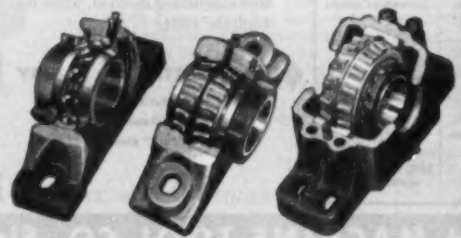
They have protection against over-lubrication

Each solid housing block is equipped with a pressure relief grease fitting to avoid damaging pressures.

We invite you to discuss your ball and roller bearing requirements with an experienced Link-Belt Bearing Engineer. May we send Data Book No. 2550?

LINK-BELT COMPANY Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Minneapolis 5, Houston 1, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in Principal Cities.

A complete line of bearings is available from stock, throughout the country, in pillow blocks, cartridge, flanged cartridge, flanged, hanger and takeup blocks —also unmounted bearings.



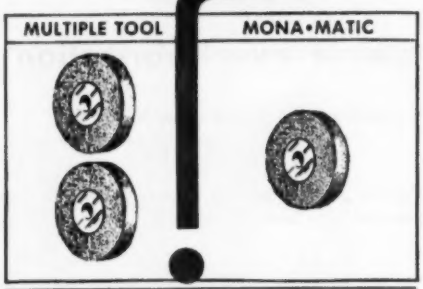
LINK-BELT

BALL & ROLLER

BEARINGS

MONA•MATIC or Multiple Tooling Methods ..WHICH?

LET'S TALK ACCURACY!



	Multiple Tool Automatics (Battery of Four)	Mona-Matics (Battery of Two)
Production	120/hour	160/hour
Cutting Tools	Cemented Carbide	Cemented Carbide
No. of Tools	40	4
Cost of Tools (including one replacement set)	$4220	$187
Setup Time	28-30 hours	46 minutes
Total Horsepower	80-120	40
Floor Space	150-200% more than Mona-Matics	
Subsequent Grinding Operations		50% less time than multiple tool

Would you like to cut your grinding time in half? It's just as simple as that.

On the typical steering knuckle job detailed at the left, the increased accuracy of the Mona-Matic method reduces the time for subsequent grinding operations to 50% of that required by the former multiple tool automatic method. Stepless single point Air-Gage Tracing is inherently accurate—and easier to *keep* at maximum accuracy as normal tool wear necessitates adjustments.

But bear in mind that reduced grinding is not the whole story of the Mona-Matic's outstanding ability to cut your costs. You'll save on production time, on tooling costs, on setup time, on power consumption and on floor space, too. For the full facts on how Monarch's famous Mona-Matics will outperform any ordinary multiple tool machining method, write for Bulletin 1804.

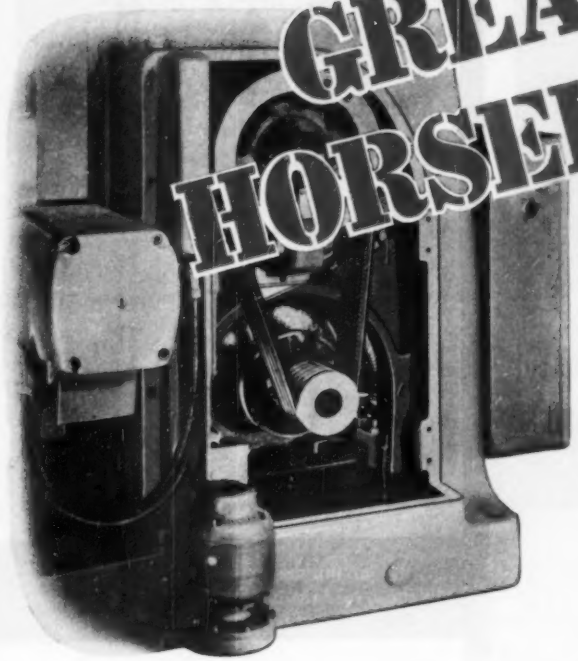
COMPARATIVE CASE STUDY

Part—Steering Knuckle,
SAE 1045, turned section—3 3/8" long, 3/4" to 2" diameter

ACCURACY · ECONOMY · LONG LIFE
Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO. Sidney, Ohio

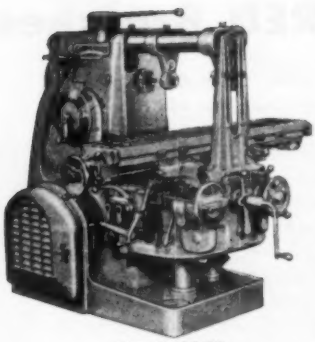
GREATER HORSEPOWER



The increasing use of carbide and cast alloy tools for milling ferrous and non-ferrous materials, has demanded Greater Horsepower to get fullest advantage of these tools. You'll find new CK milling machines meet this demand. Depending on machine size, (No. 2, 3, 4, 5, or 6) you get 10 to 25 hp independent motor drive for spindle plus separate 3 to 5 hp feed and rapid traverse drive. Motors are interlocked with positive automatic safety control for overload conditions. No danger of stalling cutters in cut.

A new line of knee-type milling machines

KEARNEY & TRECKER MILWAUKEE **CK's**



New Model CK
10 hp No. 2 Plain Style
Milling Machine

YES, Kearney & Trecker's new CK milling machines are packed with design and operating features that make them more productive, more profitable for you.

New CK columns give you greater rigidity. Compared to former columns, they give you 1000 pounds more metal in heavier ribbing, in box-type, sponson construction to absorb the heaviest cutting loads.

Spindle-mounted flywheel, broad feed and speed ranges plus Greater Horsepower give you the opportunity to obtain fullest possible benefit from modern cutting tools.

New design 2" diam. table feed screw affords greater bearing contact between screw and nut and is equipped with positive-acting backlash eliminator. Features that guarantee smoother feed for conventional and climb milling, longer screw life and greater accuracy.

For greater production, these machines are equipped with Kearney & Trecker's famous Mono-Level Control that shortens floor-to-floor time, and materially reduces operator fatigue. New, non-glare micrometer dials help avoid costly errors in reading . . . give you a positive lock at every setting.

Automatic flood lubrication in column and knee and positive metered lubrication to table and saddle, plus generously proportioned gears and shafts assure you greater machine life.

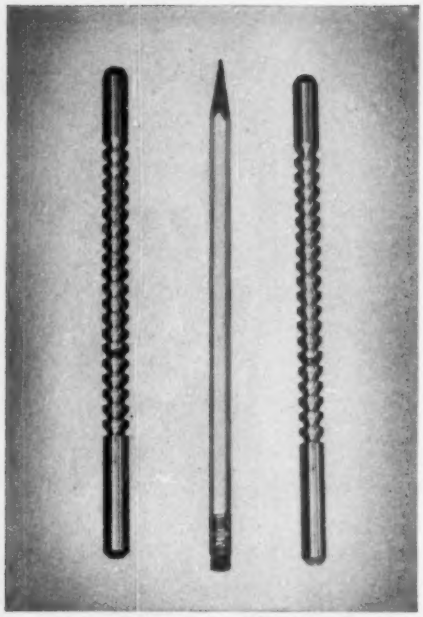
Find out for yourself about Kearney & Trecker's new CK line of knee type milling machines . . . how they meet every demand of modern milling practice . . . how they can give you greater production at greater profit.

Sizes are No. 2, 3, 4, 5, and 6 . . . Plain and Universal styles. For complete details, contact your nearest representative or write direct. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

REPLACEMENT OF OBSOLETE MACHINE TOOLS IS AN INVESTMENT THAT MAKES BOTH DOLLARS AND SENSE

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Perhaps your job calls for a big, husky, man-sized broach like this 76" involute spline broach, built for a leading gear manufacturer.



. . . or maybe you use small broaches . . . like these, for broaching automotive ignition parts.

precision QUALITY in any QUANTITY with American ENGINEERED Broaches

Write today for your copy of Catalog No. 450, 32 pages packed with useful, practical broaching information.

Big. Small. Short. Tall. Two, 200 or 2,000 at a time. When American builds broaches, you can count on this:— A standard of precision that will consistently give you top economy in production . . . a quality that delivers a maximum number of parts between resharpenings . . . and a maximum number of resharpenings for longer broach service life. You can expect these advantages with American-engineered broaches. You get them because American gives you more than thirty-one years experience with broaches, fixtures and machines . . . twenty-five years of close cooperation with manufacturers. Knowing all three, they can engineer to get the most, production-wise, from all three. Why not present your next broaching problem to American for a profitable solution? Send part print or sample and hourly requirements for their obligation-free recommendations. Address Dept. A.

AMERICAN **American BROACH & MACHINE CO.**

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

HOLES
HOLES
and more HOLES
1500 of them

To be sure, this may be an unusual job. However, it proved the flexibility and practicability of the Bullard Spacer.

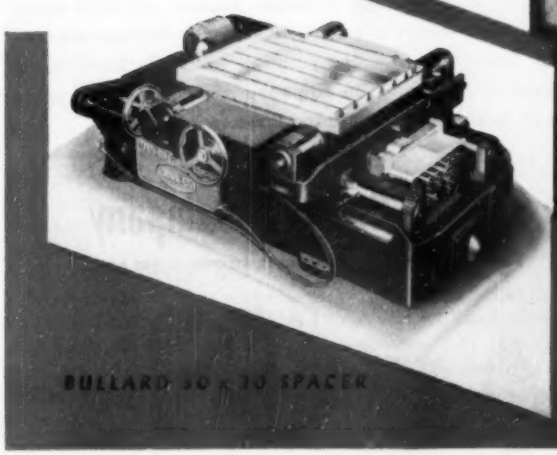
It required several combination of settings between the work location on the table and the drill saddle and arm.

However, the actual set-up and machining time figured 5-⅓ hours for the Spacer instead of 11-⅓ by the best previous method.

This case study illustrates the possibilities and wide application of the Bullard Spacer.

Here is a machine for spotting, drilling, counterboring, reaming, or tapping—without jigs.

Ask Bullard Engineers how your Jig Costs and problems can be reduced.



BULLARD 30 x 30 SPACER

THE
BULLARD
COMPANY
BRIDGEPORT 7, CONN.

BARBER-COLMAN HEAVY-CUT *Reamers*

RIGHT OR LEFT HAND SPIRAL

FOR

- **HEAVY STOCK REMOVAL**
- **FREE CUTTING ACTION**
- **CORE REAMING**
- **FINAL FINISHING AND SIZING**

THIS NEW DESIGN OFFERS GREATER END CUTTING, STRENGTH AND BLADE SUPPORT.

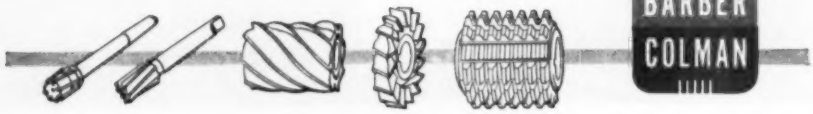
★ ★ ★ ★ ★

NEW 2° WEDGE, WITH BLADES PIN-MOUNTED IN BACK, PROVIDES CUTTING ACTION EQUIVALENT TO SOLID DESIGN.

★ Roughing, Semi-Finishing, Finishing — these new "**Heavy-Cut**" Reamers produce better quality holes with fewer sharpenings. The rigidity and strength, produced by the action of the 2° wedge and reverse pin mounting, is equivalent to solid design — replacement blades offer long life, and cost saving advantages. Short style, Long style, Straight or Taper Shanks and Shell types offer a wide selection to meet a variety of production requirements. Check your reaming problems with a Barber-Colman representative today. You can save money on rough, semi-finish or finish reaming by using this new line of tools.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 9134 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.



BARBER COLMAN

Production Pointers from GISHOLT

COST CUTTING IDEAS

Gisholt—A Unique Service in the Machine Tool Industry. Here you obtain unbiased help on your turning problems, because Gisholt's broader range of equipment includes both manually operated turret lathes and automatic lathes. Gisholt's recommendations are made without prejudice for one type of machine over another.

14 SURFACES MACHINED IN ONE CHUCKING BY NO. 12 HYDRAULIC

Multiple Operations Handled in 74-Second Cycle

The part being machined here is an important component in Packard's automatic transmission, "Ultramatic." It's a cast aluminum transmission converter pump.

The trick was to machine all fourteen surfaces in one chucking. The Gisholt No. 12 Hydraulic Automatic Lathe got the job because it does this—and machines them so well that no further processing is required.

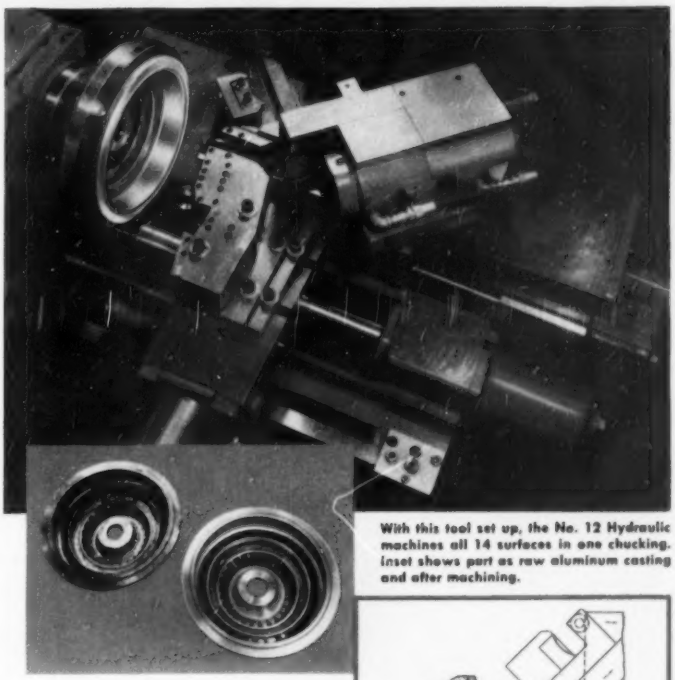
Vacuum Chucking Fixture Used

The part is held by a special vacuum chucking fixture. A rubber collar in the center and a ring around the 13½" diameter seal off the back of the part to hold it against the locating buttons.

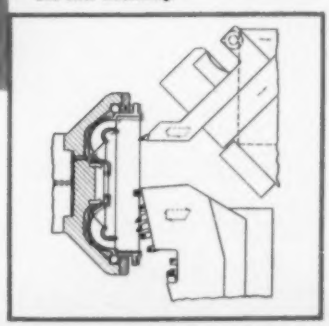
The standard front carriage has nine tools which feed both into the work and across the faces—to bore, turn, face and chamfer in a single operation.

The main slide at rear moves parallel to the spindle centerline, while the auxiliary slide is mounted at an angle. Although only one tool bit is used, this turns the radius on the hub as well as faces and breaks a corner on other sections. As the main slide feeds toward the spindle, the auxiliary slide picks up a cam and generates this radius for a distance of 1.781 inches. It then feeds backward to face and break the corners on the other sections.

The complete operation takes 74 seconds, floor to floor. This rate means maximum tool life—and, therefore, less non-productive time.



With this tool set up, the No. 12 Hydraulic machines all 14 surfaces in one chucking. Inset shows part as raw aluminum casting and after machining.



SMART TOOLING SLASHES CRANKSHAFT MACHINING TIME 80%

Finishing of Crankpin and Bearing Surfaces in Same Operation Does the Trick

Another case where headwork pays off! Sharp production men came up with this nifty tooling on a Gisholt 2L Saddle Type Turret Lathe to drive costs way down on limited quantity work.

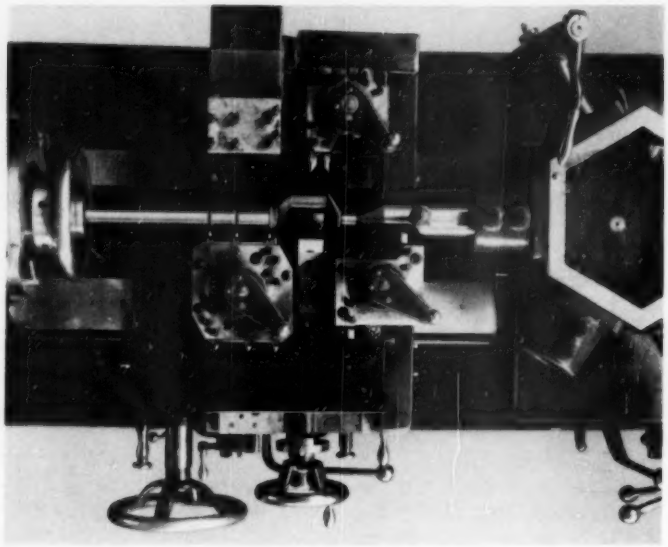
The job is a crankshaft for a farm machine. Formerly, it took over an hour per part. Now, with a maximum number of tools working, all surfaces are machined in one chucking—even the crank-throw!

Main and Crankshaft Bearings Turned in 1 Operation

Here's the setup: A special cross slide carries two quick indexing square turrets at the front, with tools for rough and finish turning five shaft diameters. At the rear is a solid block with tools for facing four shoulders on the shaft's long end, and a square turret with tools for rough and finish turning the crank bearings.

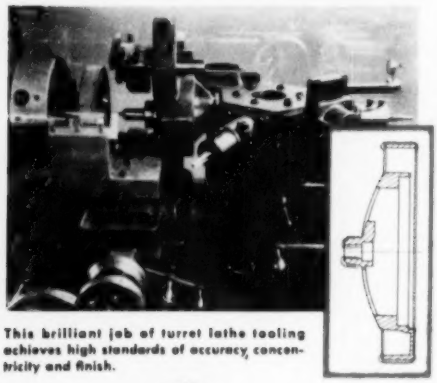
The hexagon turret has tools for centering and chamfering the end, and a self-opening die for threading the short end. A lubricated fixed center is used when the main bearings are turned, and an offset center supports the shaft for machining the crank bearings. Special hand-operated indexing collet chuck, accurately balanced, minimizes vibration while work runs at high speed off-center.

Result of this setup: a completed crankshaft every 12 minutes—a worth-while financial return on this machine investment!



Looking down on a smart tooling setup that boosted production 5 to 1.

A LITTLE SPECIAL TOOLING—A LOT OF "SPECIAL" PRODUCTION



This brilliant job of turret lathe tooling achieves high standards of accuracy, concentricity and finish.

14 Surfaces Machined in 1 Chucking Takes Less Than 4 Minutes on Ram Type Turret Lathe

Here's an excellent tooling job that pays handsome dividends. The parts—10" flywheels—have 14 surfaces to be machined. 10 of them (including chamfers) require only 1 cut. 3 surfaces, (including the O.D.) need both a rough and finish cut. The highly accurate tapered bore requires 4 separate passes.

The use of special tools makes this a high production machine. A motor driven speeder permits simultaneous drilling and turning. A back facing attachment saves an additional machining operation. A special tool block on the front slide straddle faces, chamfers both O.D.'s and with a simple lever movement makes the chamfer on the back I.D. of the rim.

GISHOLT

OVER-AGE MACHINE TOOLS MEAN

GISHOLT
COST CUTTING IDEAS

FASTERMATIC REMOVES 27 LBS. METAL IN 17 MINUTES

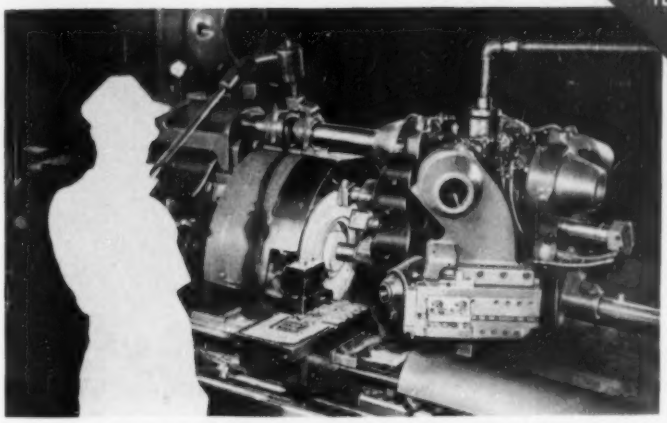
15 Surfaces Machined in Single Operation

The job given to this Fastermatic is semi-finishing transmission covers, which in rough casting form tip the scales at 95 lbs. Seventeen minutes and 15 operations later they are 27 lbs. lighter—machined and ready to move on.

This steel casting is loaded by electric hoist, and held in 18" air chuck with 3 compensating jaws and 3 jacks. First, the end of the hub is faced from the turret. In the next position, the second face and flange are rough and finish faced from the front and rear cross slides. In the third position, the case is bored full length and counterbored; the O.D. of the second face is rough turned and rough undercut from the turret.

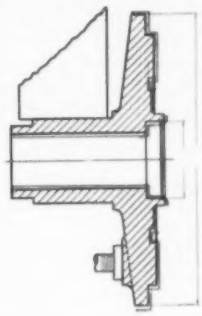
In the fourth position, the counterbore is semi-finished, the O.D. turned and the second face finish undercut from the turret. Next, chamfer of the counterbore is done from the turret. In the sixth and last position, final operations from the turret finish counterbore and finish turn the diameter of second face.

The Fastermatic machines all 15 surfaces automatically, providing a machining efficiency of 92% on the floor-to-floor time per piece.



15 operations are performed by this Fastermatic Automatic Lathe to remove 27 lbs. of metal.

From rough steel casting to semi-finished cover in only 17 minutes.



Operations required to machine transmission case.

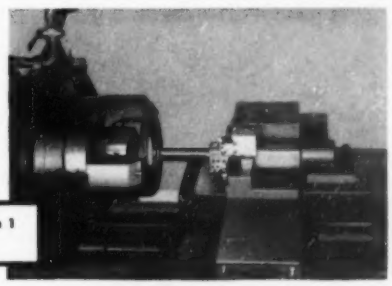
HOW TO MACHINE *BOTH* SIDES IN 1 CHUCKING

Handle any parts like this bevel ring gear? Then take a tip from this setup and save both an added operation and an extra handling.

This Simplimatic Automatic Lathe is used for both boring and facing. Pilored tools on the center slide rough and finish bore, as well as chamfer. Tools on the front slide rough both outer faces, while finishing is done from the rear slide.

The back facing attachment is cam operated and mounted inside the spindle. Just before the finish boring tool engages the work, this attachment faces and chamfers the back counterbore.

A Gisholt-Barker Wrenchless Chuck holds the work. This is air actuated from an external cylinder to leave the spindle free to contain the back facing attachment.



Fast machining of both gear sides in 1 chucking and 1 operation.

UNDER-PAR EFFICIENCY...*REPLACE NOW!*

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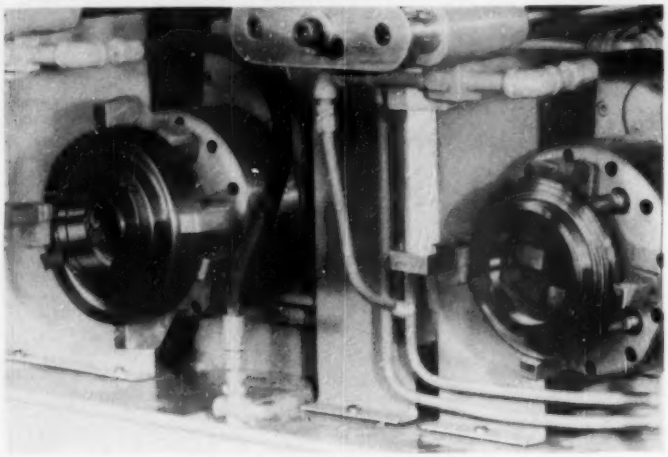
COST CUTTING IDEAS

SUPERFINISHING INTERNAL SURFACES SAVES ALL AROUND



Set-up for Superfinishing internal surfaces.

Takes Seconds Where Grinding Required Minutes

No wonder Superfinish has so many boosters! Take this case: The internal finishing of automatic transmission parts. Costs were too high, time too slow with the old way of *grinding* down these internal surfaces to 10 micro-inch finish. Tricky work, too—because it was necessary to "spark out" to hold the tolerance. It often took 4 to 5 minutes per part.

Grinding Time Cut

This manufacturer found that lots of hours could be saved by Superfinish. Today the parts are ground to only 30 micro-inches instead of 10. Real time savings on this alone. Then, on a Model 54-A Two Spindle Horizontal Superfinisher, the parts are brought down to 10 or less micro-inches, removing approximately .0002" stock. This operation: only 15 seconds, floor to floor.

3-Way Benefits

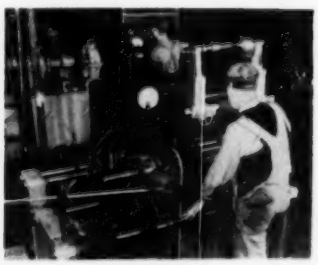
A look at the score convinced this manufacturer that he's saving three ways. *First,* he's getting far better finish for a better wearing surface. *Second,* time is cut from about 4 minutes to less than 1 minute. *Third,* machine investment is lower, and a single operator handles both spindles.

HAVE PROBLEMS?

If you have a problem in the finishing of cylindrical surfaces, get the full story on Superfinish. Write for the book, "Wear and Surface Finish." It's free—and excellent reading.

RAILROAD MODERNIZATION BRINGS NEW SHOP PROBLEMS—NEW TECHNIQUES

In foreground is DYNETRIC Type S Balancing Machine which handles all types of armatures up to 300 lbs. In the background is a DYNETRIC Type U with a capacity of 6,000 lbs. Work piece is a traction motor armature.



Precision balancing lengthens life of electrical parts

With the trend toward diesel motive power and modernization of passenger car equipment, railroad shops have a marked increase in electrical maintenance work.

In turning to Gisholt Balancing Machines, many electrical shops report increased service life ranging as high as 300% over previous records. Furthermore, Gisholt Balancers enable the railroads to handle this rather specialized operation on a routine basis despite the great diversity of sizes and types of armatures, etc. Greater accuracy has resulted in substantial savings—first, by reducing the frequency of failures, and second, through the more efficient operation of equipment.

If you have the problem of maintaining electrical equipment, you'll enjoy reading the article, "Precision Balancing." It explains how the railroads are solving this diversified problem. A complimentary reprint of the article will be mailed to you on request.

DYNETRIC BALANCERS GISHOLT

The Gisholt Round Table represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

No. 850

GISHOLT

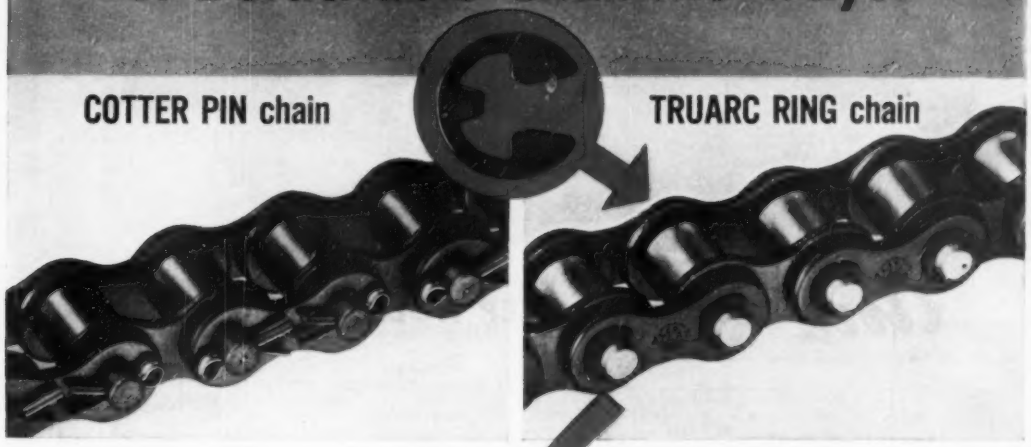
GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

A general catalog on machines listed below is available on request.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Truarc E-Rings Improve Performance of Detachable Chain...5 ways!



In every possible kind of test—tensile, impact, shock, speed—detachable chain made with Truarc Rings outperforms chain equipped with cotter pins! That's what Atlas Chain & Manufacturing Co., Philadelphia, discovered, after pioneering chain with Truarc E-Rings.

Improve your own product with Truarc Rings! Wherever you use machined shoulders, collars, cotter pins, bolts, nuts, screws, snap rings...a Truarc Ring will do the job better: improve performance, cut unit cost, save space and weight, eliminate parts, permit use of stock sizes, eliminate skilled labor operations, simplify maintenance.

Truarc Rings are precision-engineered. Quick and easy to assemble, disassemble. Give a never-failing grip. Can be used over and over again.

Find out what Truarc Rings can do for you. Send your blueprints to Waldes Truarc engineers, for individual attention, without obligation.

Waldes Truarc Retaining Rings are available for immediate delivery from leading ball bearing distributors throughout the country.

1. STRONGER. Average 30% higher *static thrust strength* than cotter pins. Resilient E-Ring reinforces links against exceptional *side stress*—resilient spring is most efficient means of damping vibration.

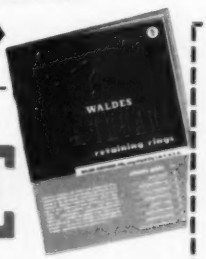
2. GREATER SHOCK RESISTANCE. Higher *shock strength ratios* than cotter pins, due to greater contact surface plus spring reaction for damping moment of shock. Circular movement of ring in groove relieves *shock surface loadings* —instead of resisting rigidly as with cotter pins in fixed holes.

3. HIGH SHOULDER. High effective bearing shoulder extends practically all around pin, and is geometrically perfectly proportioned to link diameter.

4. RE-USABLE. No part of E-Ring fatigues and breaks off, as with ends of re-used cotter pins. Ring removes easily with screwdriver.

5. REDUCES ACCIDENTS. Does not protrude to catch onto clothing. No sharp-pointed ends to produce electrical brush discharge and resultant fire and explosion hazard in mines and mills.

SEND FOR NEW CATALOG



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REG. U. S. PAT. OFF.

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WALDES TRUARC RETAINING RINGS ARE PROTECTED BY THE FOLLOWING PATENT NUMBERS: U. S. PAT. 2,282,949; 2,420,021; 2,411,701; 2,487,903; 2,487,902; 2,491,306 AND OTHER PATS. PEND.

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Please send the new catalog on Waldes Truarc Retaining Rings.

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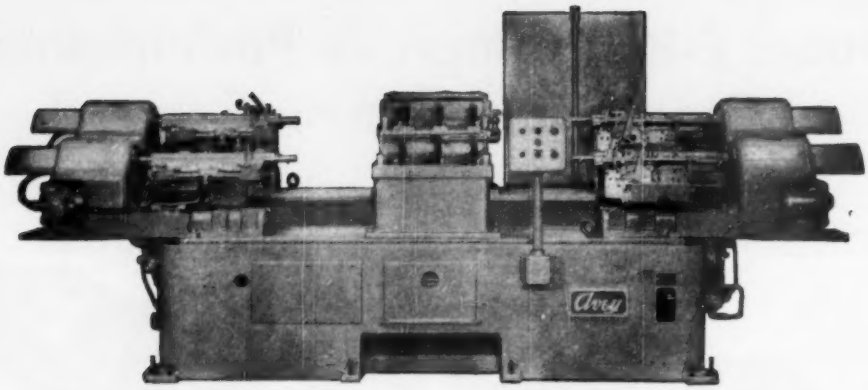
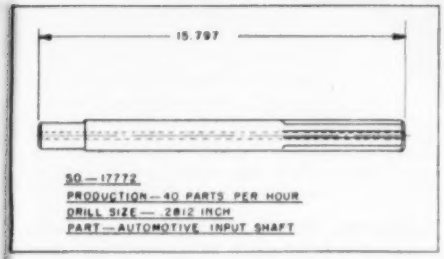


Avey HORIZONTAL DEEP HOLE DRILLING MACHINES

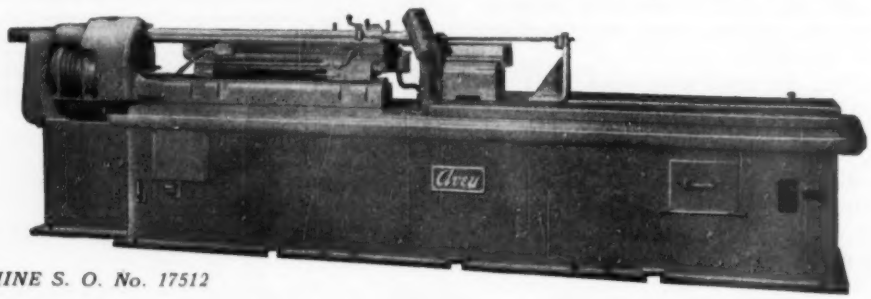


Fixtures—The fixtures were Vee Block type hand clamping to accommodate one part each.
Material—8641 Steel.

MACHINE S. O. No. 17772

Consists of four No. 1 *Avey-draulic* (hydraulic) Deep Hole Drilling Units mounted horizontally on a well-ribbed fabricated steel base. The Units having 12″ ram travel were arranged in pairs to drill a $\frac{7}{32}$″ diameter hole 14½″ deep from both ends. An electrical interlock was provided to prevent drill interference. The coolant system and hydraulic power source were incorporated in the base. Machine as illustrated conformed to Automotive Standards.

Write for Engineering Details



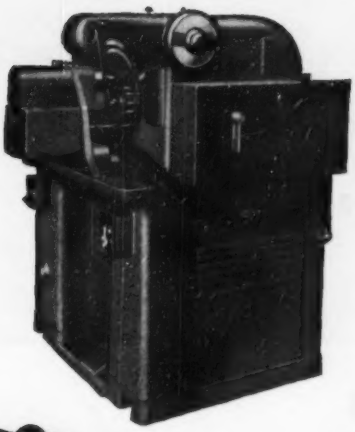
MACHINE S. O. No. 17512

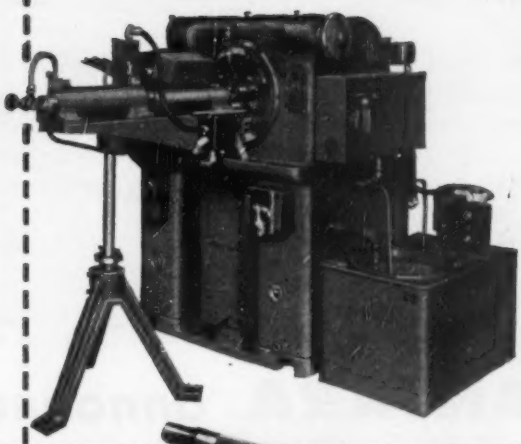
The operation on this machine is to drill a 30″ hole in steel from one end only—using a conventional Deep Hole Twist Drill $\frac{7}{16}$″ in diameter. The ram travel of the *Avey-draulic* Unit was extended to 32″. During runoff tests, holes were held to as little as .003 to .005 total runout—tolerance, of course, depending on drill grind, heterogenity of metal, and other varying factors.

Drilling time was reduced to one-third of previous method Drill breakage was reduced to a minimum by New Exclusive Torque-matic Control.

Avey DRILLING MACHINES
CINCINNATI · OHIO

THE AVEY DRILLING MACHINE CO.
CINCINNATI 1, OHIO





Thin-wall brass hose connection threaded at rate of over 2,000 per hour, using hand loader, electrically and hydraulically controlled. Parts are automatically positioned and stripped. Three-roll head used.

THREADING

Typical motor shaft serration job. Magazine loader is adjustable for several different lengths. This 5½" serration on 1¹⁄₁₆" diam. produced in machine time of 6 seconds per shaft. Three roll head and hydraulic feed through.

FORMING

You can ROLL it

--More Accurately--More Economically on a NAMCO

The Namco Triple Roll Hydraulic Thread and Form Rolling Machine is built for precision *and production*. It is equally at home on solid or hollow work; three point direct roll support eliminates distortion.

The addition of magazine feed and hydraulic loader further decreases cycle time in the production of close tolerance, fine finish work in mass quantities. Capacities range from ³⁄₈" to 1½" diameter using three rolls—and ⅛" to ⁹⁄₁₆" using two rolls.

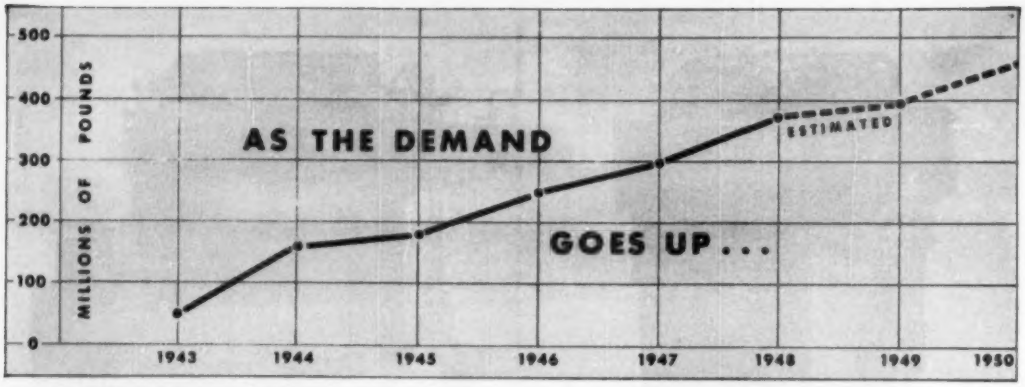
Send us samples of the jobs you do; we'll be glad to prepare a recommendation and quotation on your requirements.

Ask us for your copy of this twelve page bulletin (TR49) giving complete details on the Namco Thread Roller.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing



ANTARA® announces new low prices on NON-IONIC SURFACTANTS

Antarox A-200, A-201, A-400, A-401, A-402, A-403, A-404, A-480

Alkyl aryl polyoxy ethylene glycols

. . . in a complete series with varying properties and degrees of water-solubility—and from clear liquids to pastes and waxes

Steadily the demand increases—as industry after industry finds new and wider uses for surfactants. This young industry has already surpassed synthetic rubber in its tonnage!

The *non-ionic* surfactants are in particular demand by the makers of cleansers of every type—for the home, commerce and industry—insecticides, cosmetics, metal cleaning compounds, oils, waxes and other products.

In keeping with this trend, Antara announces new low prices—reductions of 13% to 15%—on the A-200 and A-400 Series of non-ionic surfactants. Such reductions mean that these superior agents are now priced for use by many additional compounders.

We invite your inquiry for Data Sheets and the new prices. Extensive research staffs and facilities support the development and application of all Antara Surfactants—available to work with you in the improvement of an existing product or the development of a new one. Your inquiry is invited —without obligation. It will bring a prompt opinion as to whether one of the Antara Surfactants may be adaptable to your needs. Kindly address your inquiry to Department 47.

APPLICATIONS

Detergents	Foamers
Emulsifiers	Anti-static agents for polystyrene plastics
Wetting Agents	
Dispersants	
Penetrants	Solubilizers

ANTARA® PRODUCTS

SURFACTANTS . . . CARBONYL IRON POWDERS

GENERAL ANILINE & FILM CORPORATION

444 MADISON AVENUE, NEW YORK 22, NEW YORK

1639 POPLAR STREET, OAKLAND 7, CALIFORNIA

In Canada: CHEMICAL DEVELOPMENTS OF CANADA LIMITED, LEASIDE, TORONTO 17

MONY A PICKLE MAKES A MUCKLE.

RIGHT YOU ARE, SCOTTY. LITTLE SAVINGS MAKE BIG ONES. THAT'S WHY WE STANDARDIZE ON SHIELD BRAND CUTTING TOOLS. IT SAVES TIME IN PURCHASING, IN THE STOCK ROOM, THE TOOL CRIB, AS WELL AS IN THE SHOP.

Features of

STANDARD SHIELD BRAND TOOLS

Foremost Quality—In design—workmanship—material.

Complete Line—One reliable source of supply for drills, reamers, taps, dies, milling cutters, end mills, hobs, counterbores, and special tools.

Complete Service Stock—Over 10,000 items regularly carried in factory stock.

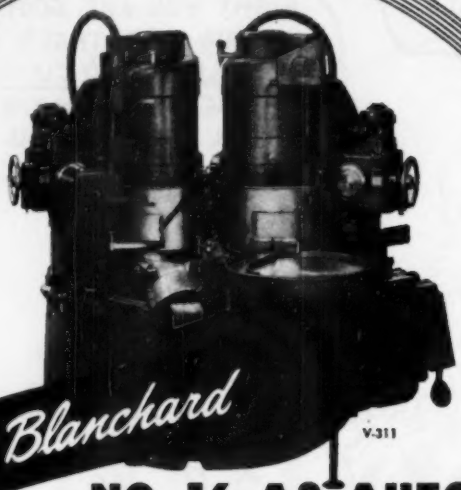
Nation-Wide Availability—Stocked and supplied by leading Industrial Supply Distributors coast to coast.

Our service staff is ready to help if you're faced with a tough metal cutting problem. They have been at it since 1881. Write us. There's no cost or obligation, of course.

STANDARD TOOL CO. CLEVELAND 4, OHIO

New York • Detroit • Chicago • San Francisco

THE STANDARD LINE: *Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*

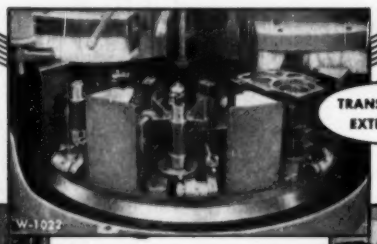


Put them on a Blanchard

NO. 16-A2 AUTOMATIC

This two-spindle surface grinder is a real producer. In a single pass, the work is roughed by one wheel and then finished by the second wheel. Because each wheel can be selected for its part of the grinding operation, without having to compromise between roughing and finishing, the No. 16-A2 is particularly suited to work requiring high production. Close limits are assured by automatic size control for each wheel. If you're looking for maximum results with minimum effort, get production details on just how fast your own work can be done on the No. 16-A2.

Send blueprints or samples — there is no charge or obligation.



The joint face is ground by loading the cast iron part over a post, locating from a shoulder, supporting the flange by a spring bunter. It is clamped automatically. Parts are held flat to .001", square with bore to .002", and to ±.001" for size. 84 pieces ground per hour on one side.

These cast iron caps are placed in suitable stations, automatically clamped, ground, and automatically unclamped. 1020 caps per hour are ground to ±.003", and flat to .002" in a 20 station fixture. 1/16" of stock is removed per side.

Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

These cast iron parts are loaded with the flange under a "U" shaped block, clamped upward against the block. The four bearing surface "feet" are ground to limits of ±.003", parallel to flange within .001". 229 pieces are ground per hour on one side.

PUT IT ON THE BLANCHARD

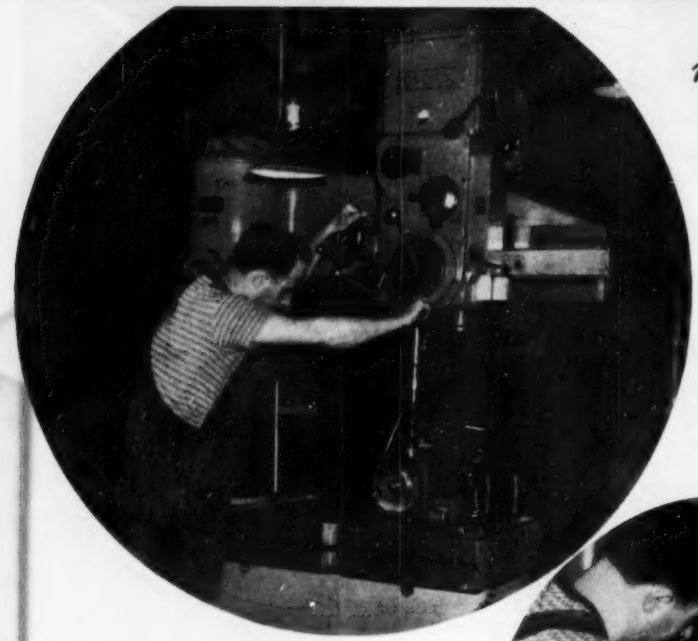
THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

Universal Standard Drill Bushings with **super finish I.D.** lengthen the bushing life . . . reduce tool breakage . . . slash drill wear. Then, add the plus features of blended radius, knurled head, I.D. break, chamfered O.D., and you have the reasons why Universal Drill Bushings are specified by many of America's largest manufacturers. All catalog sizes are available for immediate shipment. Extra prompt sectional delivery and information are provided by warehouses at 1060 Broad Street, Newark, New Jersey, and 5035 Sixth Ave., Kenosha, Wisconsin. Write, call or wire today!

Facilities available for special hardened and ground precision parts made to customer specifications.

FOSDICK SENSITIVE RADIALS

provide the answer for a host of sensitive drilling jobs



Photos Courtesy of S. A. Woods Co., Boston, Mass.

● This modern machine tool is adaptable to an exceptionally wide range of sensitive drilling operations.

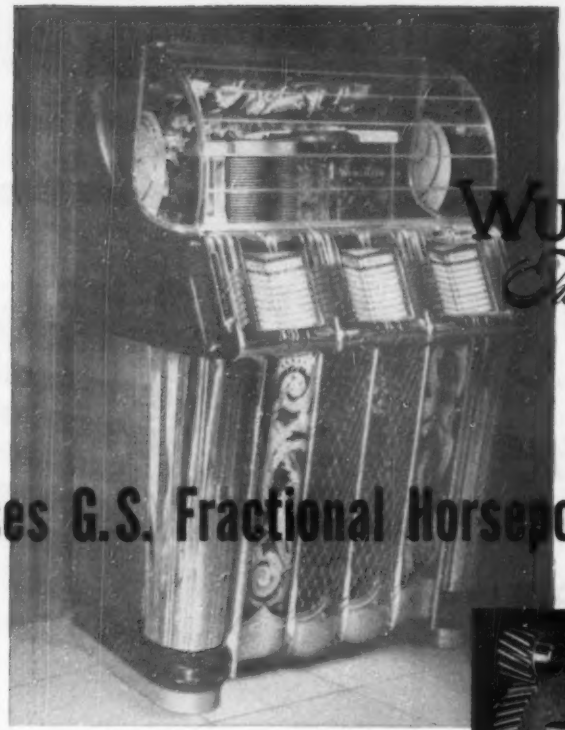
Its unique design which combines the advantages of radial design on sensitive operations has proved a time, labor, and cost saving unit on many jobs which formerly required heavier, more costly machines.

The simplicity of design and construction make for ease of operation and low cost production.

The nine speeds and four feeds both obtained through direct levers on the head facilitate operation where changes in speeds and feeds are necessary on the job.

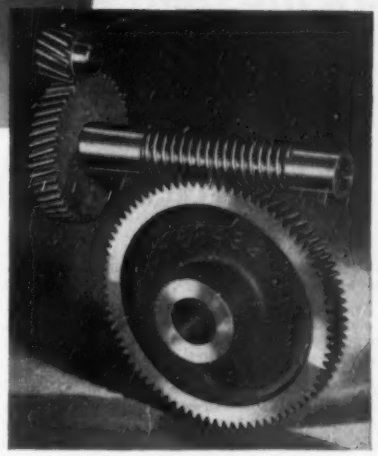
For full details of construction and operation — ask for the new Fosdick Sensitive Radial Bulletin S.R.A.

FOSDICK MACHINE TOOL Company
CINCINNATI 23, OHIO



The WURLITZER *Twelve Fifty*

Uses G.S. Fractional Horsepower Gearing



THE new Model Twelve Fifty measures up to the traditional WURLITZER reputation for *quality!* G. S. Fractional Horsepower Gearing contributes much to the *smooth,* dependable, trouble-free performance of this fine phonograph. Here, as in so many other instances, G. S. skill and 30 years' experience has been called upon to *mass-produce* small gearing uniformly and to the most *exacting specifications!* Here again, G. S. lends effective aid in perfecting a device designed to outperform and outsell all competition!

If production runs of decidedly *better, more uniform, smoother,* Small Gearing is an important consideration in YOUR business, by all means discuss your needs with a G. S. engineer. Let our trained organization of Small Gear *Specialists* demonstrate their unusual abilities to create and *economically* produce the kind of *gearing performance* you have always wanted. Suggestions, ideas, and moderate cost estimates won't cost you one penny. Will you write or phone us today?

SEND FOR *free G.S. catalog-bulletin describing many different types and applications of our Fractional Horsepower Gears.*

FRACTIONAL HORSEPOWER GEARING

GS

GEAR Specialties, Inc.

Spurs · Spirals · Helicals · Bevels · Internals · Worm Gearing · Racks · Thread Grinding

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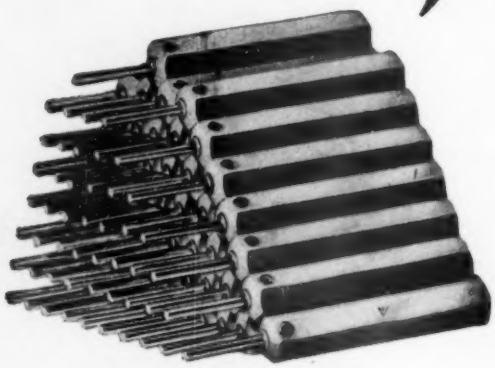
MEMBER OF

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

Van Keuren

CARBOLOY
Wire Type
PLUG GAGES
are the right answer



1 VK CARBOLOY=50 TOOLSTEEL GAGES

After considerable experimentation with various wear resistant materials, we have chosen Carboloy as being the most practical, durable and economical. Carboloy does not flake or chip easily and is quite suitable for wire type plug gages as small as .020" in diameter.

Wire Type Plug Gages were originated by the Van Keuren Co. in 1925 and are now recognized as the most economical gages for measuring small holes. The original wire type plug gages were made of tool steel—High Speed steel doubled gage life. VK Chromium Plate gave 5 times the life, and VK Carboloy 50 times the life of tool steel gaging units. All of these materials are still in use and have their particular applications.

VK Carboloy gaging units are made in sizes from .020" to .500" diameter. They are made only in the wire type design because this is by far the most economical plug gage. In cases where it is desired to use VK Carblooy wire type Go units with existing No Go taper insert unit, special handles can be furnished for this purpose.

Van Keuren Wire Type Plug Gages assure longer lasting precision and lower gage cost, because the entire 2" length of gage can be used. When the end of the wire becomes worn, it is ground off. The wire type unit is securely held in the unit by a split bushing and a headless set screw.

VK Carboloy Wire Type Plug Gages are made to Class B accuracy, plus .00005", minus .00000" on the Go unit and plus or minus .000025" on the No Go unit. Closer or wider tolerances can be supplied if desired.

On your next order Specify VK Wire Type Plug Gages; VK Carboloy for long runs because of the enormous saving in gage cost; VK Carboloy for fussy jobs because of the infinitesimal gage wear and insurance that the parts will be within the specified limits; VK Tool Steel—High Speed Steel—Precision Chromium for less exacting jobs. You will be assured of the best in accuracy, quality and delivery.

CATALOG AND HANDBOOK No. 34

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

31st YEAR

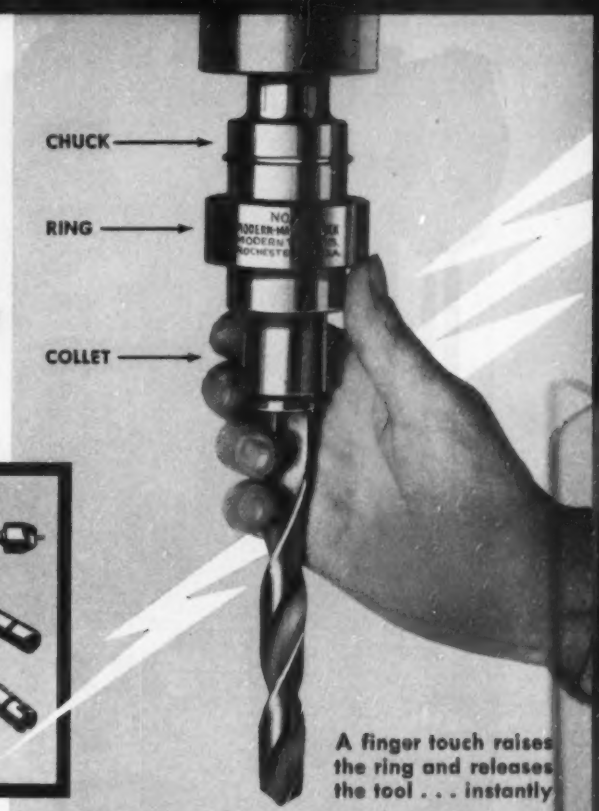
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

Speed up your production

Change tools without stopping . . . or even slowing the machine

MODERN-MAGIC
QUICK CHANGE
CHUCK and COLLET EQUIPMENT

A few examples of the many tools, shown with collets attached, driven by MODERN-MAGIC CHUCKS



A finger touch raises the ring and releases the tool . . . instantly

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

Modern-Magic Quick Change Chuck and Collet Equipment virtually eliminates costly lost time of revolving spindle machines. Used with such machines, tools are changed without stopping or even slowing the spindle. Changes are made from drill to reamer to tap instantaneously and safely while the machine is running at cutting speed. In this way, the Modern-Magic Chuck and Collet Equipment gives multiple spindle range to single spindle machines, increasing production and cutting cost. In high production shops, it has been proved they save time even though used only for changing from dull to sharp tools.

For full information, send for Bulletin M-103. In addition to standard Modern-Magic Chucks and Collets, it shows special types of each.

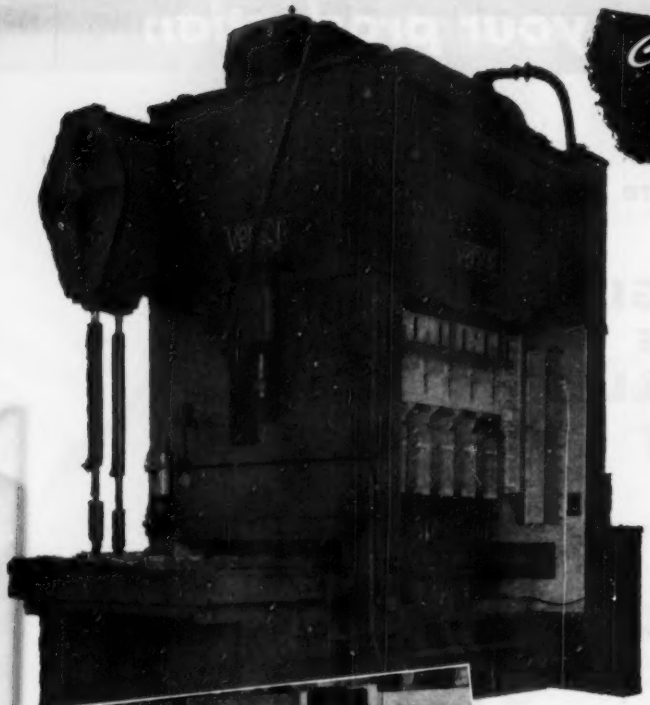
Only the ORIGINAL Modern-Magic Chuck and Collet Equipment carry the name "MODERN-MAGIC" and are manufactured by Modern Tool Works, Rochester, N.Y.

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK



Can you match these production figures?

THIS TRADE Verson MARK TRANSMAT PRESS automatically forms 900 washing machine legs per hour!

With the Verson TRANSMAT Press illustrated, five operations are performed automatically without intermediate handling, pickling or annealing. Developed blanks are fed into the TRANSMAT, although it could be fed from coil stock (scrap economy determines the method of feeding). Finished legs are discharged at the rate of 900 per hour.

By conventional methods, a production rate of only 400 legs per hour would require five presses and five operators. With a TRANSMAT, 900 legs are produced in an hour with only one press and one operator. Only one machine has to be maintained, valuable floor space is saved, shuttling of material from one press to another is eliminated and the human errors of hand feeding do not exist.

All these time and money saving advantages are yours when you use TRANSMATS for quantity production items. Call or write for full information.

The two views at left show (above) a close-up of the die stations and transfer mechanism and (below) completed legs being discharged from press.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

9316 South Kenwood Avenue, Chicago 19, Illinois — Holmes Street and Ledbetter Drive, Dallas 8, Texas

A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP!

BLANKING PRESSES • DRAWING PRESSES • HYDRAULIC PRESSES • HIGH PRODUCTION PRESSES
TRANSMAT PRESSES • PRESS BRAKES • DIES • DIE CUSHIONS • COMPRESSION MOLDING MACHINES

They cost you less to use

THERE'S A UNION REAMER FOR PRACTICALLY EVERY INDUSTRIAL APPLICATION

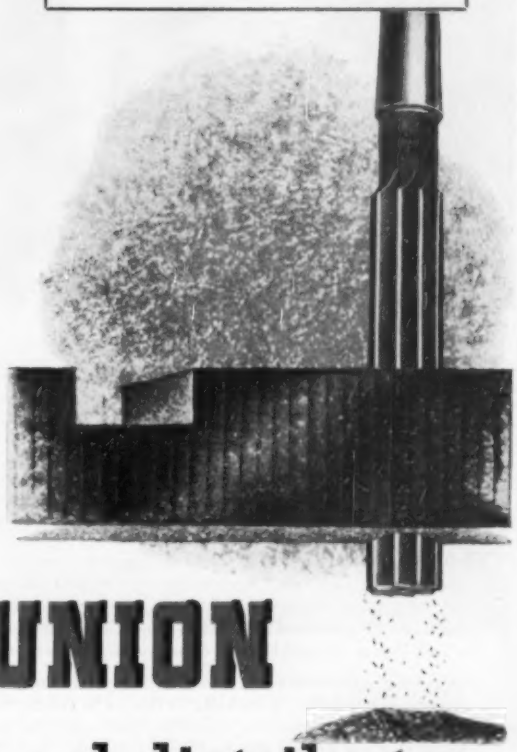
Hand Reamers
Fluted Shell Reamers
Expansion Reamers
Morse Taper Reamers
Jobbers' Reamers
Fluted Chucking Reamers
Taper Pin Reamers
Helical Flute Taper Pin Reamers
Rose Chucking Reamers
Bit Stock Taper Reamers
Bridge & Boiler Reamers
Reamer Sets

UNION *reamers, standard or special, last longer on every type of job*

Whether you're removing a lot of metal or a few thousandths, on run-of-the-mill or high precision work, Union Reamers are your best bet for the long life and accurate performance that save time and cut production costs.

Chances are your reaming jobs can all be handled by proper selections from the broad range of Union Reamers made to top-quality standards.

See your Union Distributor for all standard or special needs. If your applications are unusual, he'll arrange to get all necessary information, including sketches. Look for his name in THOMAS' REGISTER on Union's insert in the "Drills, Twist" section.



no other reamer will outperform a **UNION**

contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under "Drills, Twist."

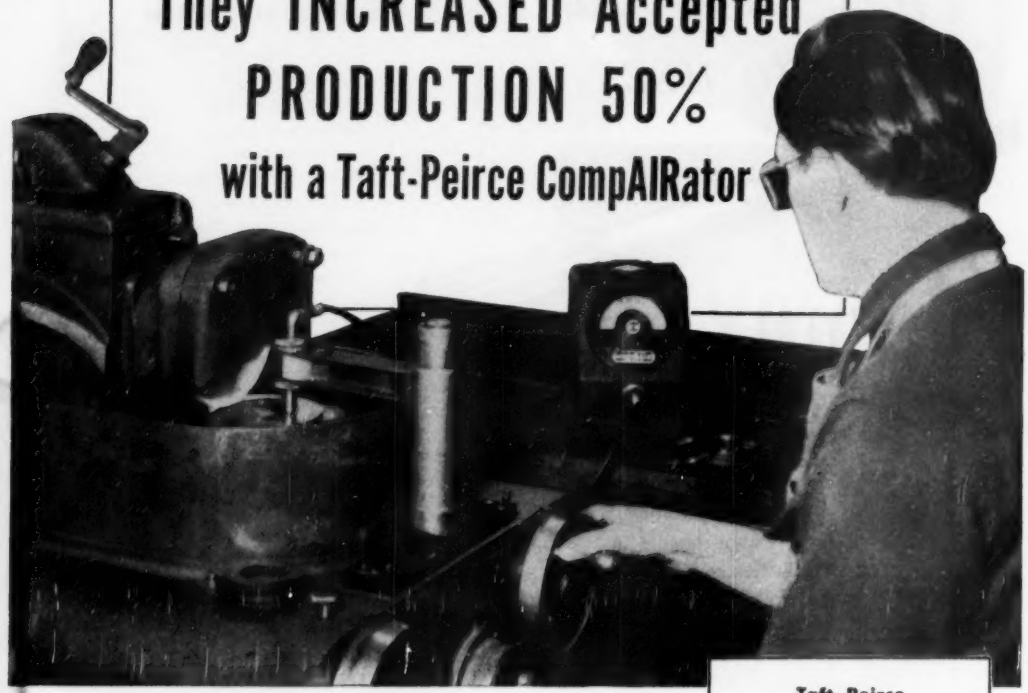
UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Milling Cutters · Gear Cutters · Twist Drills · Hobs · Reamers · Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

They INCREASED Accepted PRODUCTION 50%

with a Taft-Peirce CompAIRator



The Problem: A prominent Eastern manufacturer needed a quantity of extremely thin 3¼" O.D. circular parts of high speed steel. Thickness required was only .009"; tolerances were +.0000", −.0001". Surface finish could not exceed 8 micro-inches.

To avoid high spoilage and maintain production, highly accurate on-the-machine gaging was required. Mechanical devices were ruled out due to the adverse effects of sludge accumulation and vibration.

The Solution: A single-nozzle air gage fixture was built and attached to the saddle of a Taft-Peirce 6" Rotary Grinder. It was so designed that the air-gaging nozzle could be swung into gaging position after placing the work on the chuck. A flexible hose connected the gaging-nozzle and a Taft-Peirce CompAIRator, conveniently located beside the grinder.

Once settings were established with master size blocks, the operator merely watched the CompAIRator dial as he fed the finish cut. When the pointer moved within the tolerance span indicated on the gage dial, he knew that the proper size had been reached.

The Result: Production was increased directly by 25%. Spoilage was reduced from 20% to 1.5%. Accepted production was increased 50% per hour.

Taft-Peirce CompAIRator Air Gages

- are unhampered by sludge or coolant.
- measure without mechanical contact.
- give instantaneous readings with extensions of as much as 20 ft.
- are unaffected in accuracy by jars, bumps, or vibration.
- are self-contained with everything — filters, regulators, etc. — in a 7" x 8" x 7½" cabinet.

In your plant there are similar jobs where on-the-machine gaging with a Taft-Peirce CompAIRator can cut your costs. Write today. Send blueprints, etc., so we can submit specific recommendations.

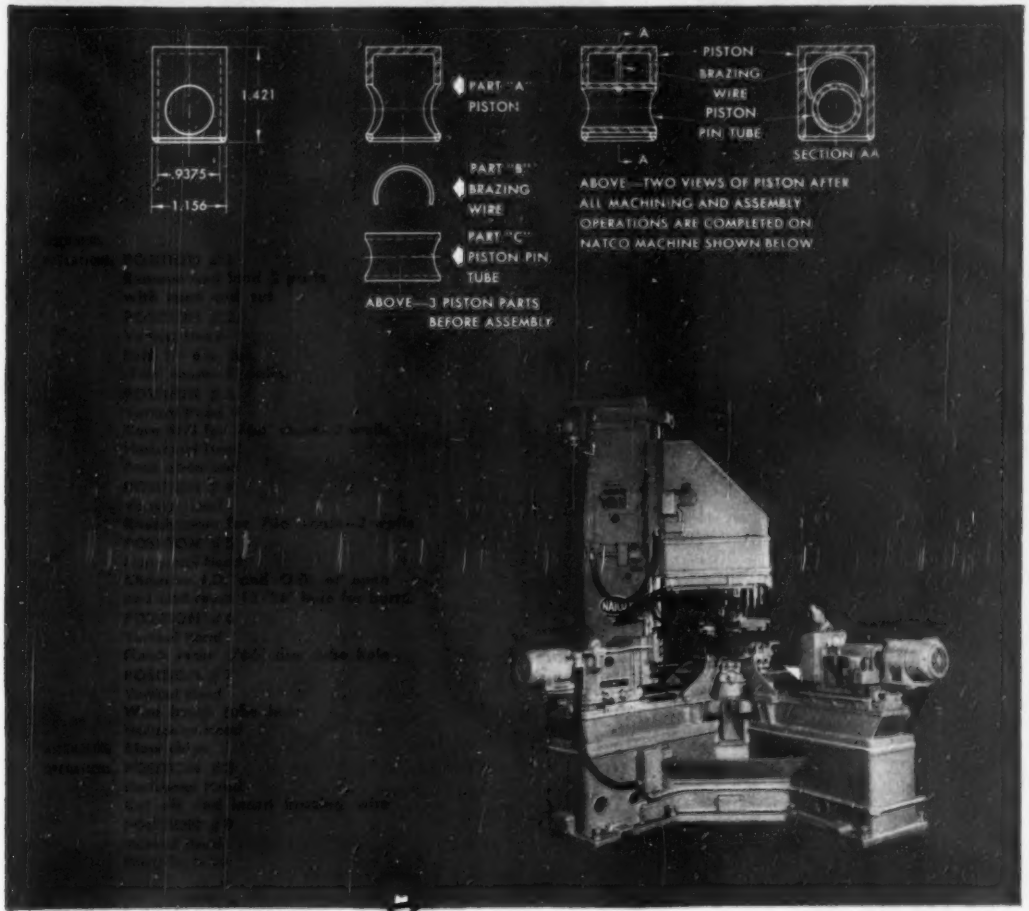
THE TAFT-PEIRCE MFG. CO.

WOONSOCKET, RHODE ISLAND

MACHINES AND ASSEMBLES

three parts automatically to complete

248 Refrigerator Pistons Per Hour



NATCO DRILLING, BORING, TAPPING AND FACING MACHINES

NATCO

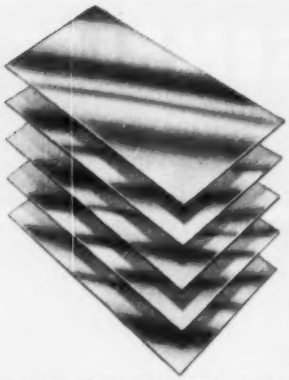
Call a Natco Field Engineer

This NATCO four-way vertical and horizontal drilling machine is just one of the many examples of the way NATCO contributes to higher production and lowered costs for industry. Send us your drilling, boring, tapping or facing problems . . . our engineers have the solution.

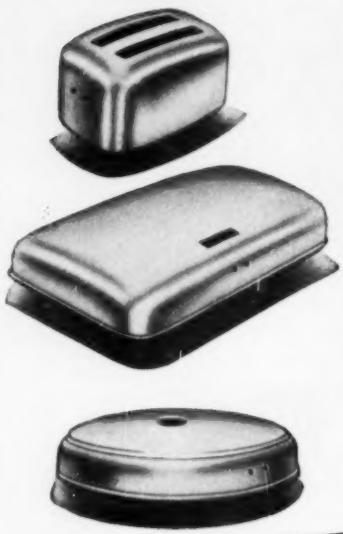
Write for NATCO "Success Story" No. 5
Dept. AM

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Ind., U. S. A.

Branch Offices: 1809 Engineering Bldg., Chicago • 409 New Centre Bldg., Detroit • 1807 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City



Smooth sheets BECOME Smooth shapes



WHEN YOU *TREAT* WITH

BONDERITE

BEFORE FORMING

From forming dies to final finish can be time consuming and costly if there are deep scratches and galled spots to polish and buff out. Bonderite can help you save that time and money by preserving the original smooth surface as the sheet is bent and stretched and shaped.

Bonderite, in forming and drawing, has several beneficial actions. The crystals hold lubricants tenaciously under pressure preventing metal to metal contact. Being nonmetallic, they act as an anti-flux, thus reducing galling and welding. Deeper draws and faster drawing speeds are possible. Die and tool life is lengthened.

Because of the freedom from scratches in normal production when Bonderite is used before forming, automatic machines may frequently be used advantageously, with resulting increased production and substantially lower costs.

Investigate the cost-cutting possibilities of Bonderite before forming on your high-finish plated or painted products. A letter will put our experience at your service.

CUT METAL POLISHING COSTS BY REDUCING DRAWING BLEMISHES

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

PARKER

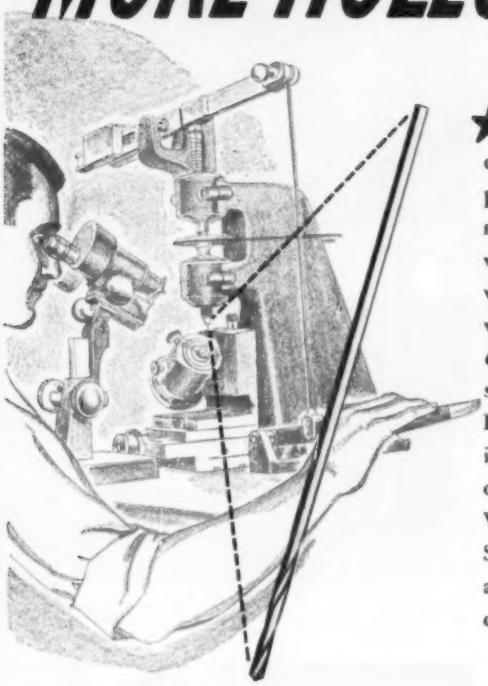
PARKER RUST PROOF COMPANY
2196 East Milwaukee Ave.
Detroit 11, Michigan

BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant • PARCO LUBRITE—Wear Resistant for Friction Surfaces

LARGE OR SMALL...

CLE-FORGE HIGH SPEED DRILLS GIVE YOU

MORE HOLES PER GRIND!

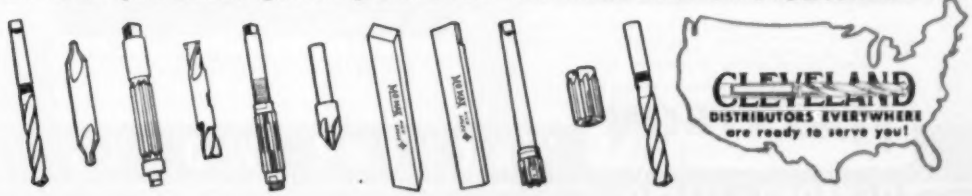


★ Did you ever sharpen a tiny drill .020" in diameter? It's a tricky job, and makes you realize the importance of getting *more holes per grind.* ◈ A shop making jet nozzle parts of #347 stainless steel was having difficulty drilling very small holes. Drills were averaging less than 9 holes per grind. The job went slowly, and costs were high. ◈ When a ***Cleveland*** Service Representative was called in, he suggested switching to the CLE-FORGE High Speed Drill illustrated here (greatly enlarged), and changing the speed from 800 to 1200 R.P.M. The number of holes per grind *was increased to more than 50!* ◈ When *you* have a drilling problem, let a ***Cleveland*** Service Representative help you step-up production and cut your costs. Contact our nearest Stockroom, or . . .

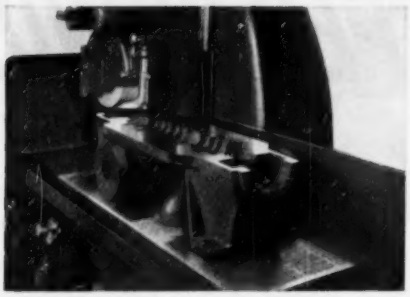
Telephone Your Industrial Supply Distributor

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England

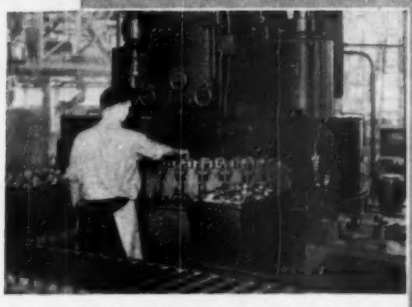
ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS



WHERE THERE IS A FLAT SURFACE TO GRIND THERE'S A MATTISON TO GRIND IT.



40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder.



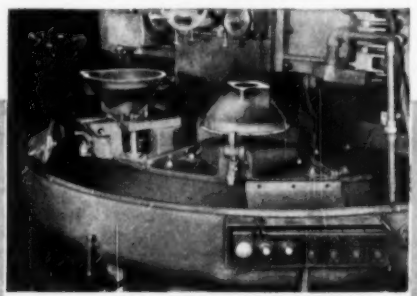
700 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder.

With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison is now in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced engineers are available to give you best production efficiency, finish and tolerances, with Mattison machines.

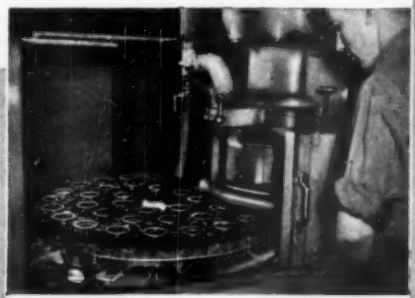
For any flat grinding ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalogs on any of the types shown or if you would like a copy of the general bulletin, let us know and we'll gladly send them to you.

Grinding Cast-Iron Cams — 5" diameter, 1½" thick — stock removal, each side .030". Production 120 surfaces per hour on Mattison (Hanchett Type) Rotary Surface Grinder.



200 Transmission Case surfaces ground per hour on Mattison (Hanchett Type) Rotary Automatic Grinder. A special 8-station mechanical fixture permits one operator to grind each end of this large 35 lb. casting, flat and parallel. Stock removal .050".



320 surfaces of cast iron compression heads per hour, removing 1/32" stock with Mattison No. 24 Rotary Surface Grinder.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

ALLIS-CHALMERS
INDUCTION
HEATERS
for low costs
like these
1/5¢ EACH
TO SOLDER
Ten faucet assemblies are soft soldered at one time . . . 360 per hour . . . on 20 kw unit.
7/10¢ EACH
TO HARDEN
100 splined shafts are hardened in hour on 20 kw unit. Cost is low; distortion eliminated.

CHECK THESE SAVINGS!

. . . What Would They Be In Your Plant?

THESE EXAMPLES ARE typical of hundreds in Allis-Chalmers files. In case after case, hardening, brazing, soldering, or annealing proved faster, cheaper, better with Allis-Chalmers Induction Heaters than with previous methods.

FASTER — because induction heating takes only seconds.

CHEAPER — because so many more parts can be processed in an hour.

BETTER — because product quality is improved by close heat control.

Not only is the cost low per part processed, but the cost of owning and operating an Allis-Chalmers Induction Heater is surprisingly low too. Here is a cost breakdown for two popular size induction heating units.

COST PER HOUR

to own and operate an Allis-Chalmers Induction Heater

	10 kw unit	20 kw unit
Tube replacement (5,000 hrs)	0.070	0.110
Fixed energy	.020	.034
Load energy 50% cycle	.140	.200
Water	.010	.032
Amortization 20,000 hrs	.244	.354
Total cost	$0.484	$0.730

It's easy to find out what Allis-Chalmers Induction Heaters can do for costs in your plant. Simply call your nearby A-C Sales Office and give one of the sales representatives the details of your heating problem. In fact, there's probably a ready answer for you in the files on a similar job already processed.

ALLIS-CHALMERS, 999A SO. 70 ST. MILWAUKEE, WIS.

Please send me Induction Heater booklet 6430A.

Name .....

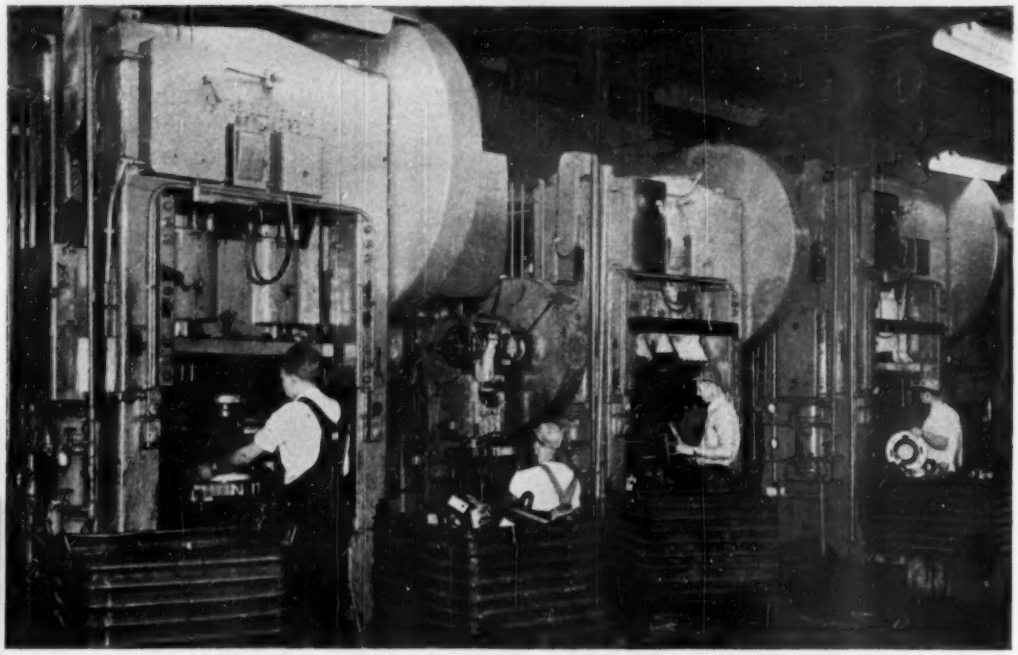
Title .....

Company .....

Street .....

City ..... State A-3142

ALLIS-CHALMERS



Cleveland Double Crank Presses form lighter parts in A. O. Smith Corporation's new production line.

A. O. SMITH Corp. chooses CLEVELANDS again!

Recently, at their Kankakee Works, the A. O. Smith Corporation decided to produce several parts that they had been purchasing. This decision required the addition of a battery of 5 new presses. We are justifiably proud that, on the basis of production performance, Clevelands were chosen. It was recently reported, by this well-known corporation that, "Every Cleveland Press in the entire line is performing exceptionally well and is very satisfactory in every respect."

This report is typical of the comments made about Cleveland Presses by leading Press users. If you do forming, blanking, trimming, punching, drawing or similar operations, let us show you how you can do a faster, more economical job with a new Cleveland Press.

We will gladly furnish you with information on any type or size of Press . . . our engineers will gladly work with you on special problems.

A-7008

PUNCHING TOOLS & DIES

OFFICES AT:
NEW YORK ... CHICAGO
DETROIT ... PHILADELPHIA
PITTSBURGH

THE CLEVELAND PUNCH & SHEAR WORKS CO.
U S A

Established 1880

POWER PRESSES

FABRICATING TOOLS

CLEVELAND 14, OHIO

get the facts straight

You'll never have to alibi for stainless if you have the facts straight about its proper applications. It's easy to regard stainless as capable of "miracles", as users of stainless are apt to do. But stainless is more than *one* type of material, it is a whole family of specialty steels available in a range of grades, sizes and finishes. Crucible, pioneers in the development of stainless steels, knows that stainless will live up to its reputation *only* when the right analysis is used.

That's why Crucible makes freely available to you an alert metallurgical staff to help you find the right stainless for your application. The best way to find out if stainless can work its "miracles" in your application is to check with Crucible. Take full advantage of our fifty years of specialty steel experience. CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

CRUCIBLE first name in special purpose steels

STAINLESS STEELS

fifty years of Fine *steelmaking*

STAINLESS • HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

It's no time to fiddle!

HEADLINES warn us of the menace of spies and subversive agents. But in every community there is a hazard, largely unrecognized, which may become ready tinder for the ravaging flames of socialism and communism. This is the misconception of everyday economic facts that exist among our young people.

For example, a recent poll among high school seniors shows that the majority of them believe that the owners of business take out for themselves a larger share of the income than is paid to employees. They think the stockholders' average return is 24% of the sales dollar. The truth is that stockholders average less than 3%, whereas over 30% of the income dollar is paid out as wages, pensions and other benefits.

Our young people do not seem to realize that paying dividends is only one function of profits. Far more important today is the need for profit to keep business competitive, and to pay for new buildings, machinery, and other necessary equipment and to provide new and more jobs. Ignorance of this fundamental concept breeds contempt for the system of enterprise that built our country and keeps it strong.

The facts of business must be given to our boys and girls to protect their future. Only business men can supply the facts. As a business leader in your community, it is your responsibility to help clear up such misconceptions. The old story that Nero fiddled while Rome burned must not have a counterpart in America.

The Youngstown Sheet and Tube Company

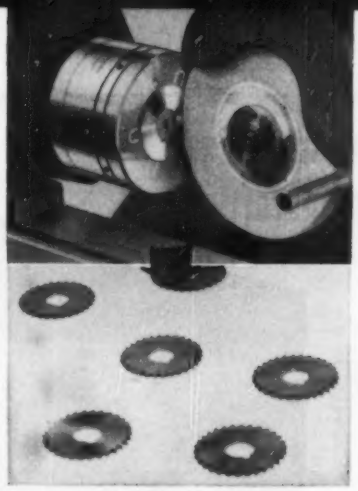
General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

RAILROAD TRACK SPIKES - CONDUIT - HOT AND COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RODS - SHEETS - PLATES.

Your best answer to holding problems

...in many of your grinding and light machining operations



FOR THIN WORK PIECES Rotary Model Permanent Magnet Chucks hold thin work pieces without distortion — permit machining down to thicknesses which would be impossible by any other means.

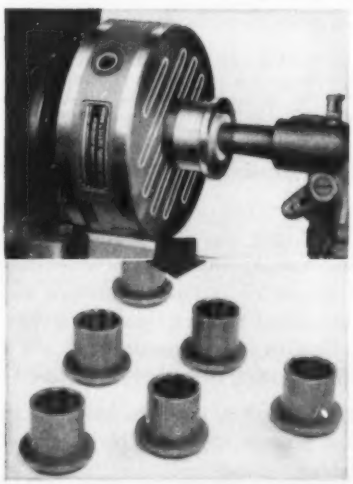
Model No. 9R has a diameter of 9¼ inches. Other stock models in 7" and 5 inches. Special sizes and shapes for particular applications.

FOR CYLINDRICAL WORK Cylindrical grinding as well as face or disc grinding is done easily and quickly with Rotary Model Permanent Magnet Chucks . . . saving both time and cost.

ROTARY MODEL PERMANENT MAGNET CHUCKS

You can save time and money by using Brown & Sharpe Rotary Model Permanent Magnet Chucks in hundreds of holding applications. They cost nothing to operate . . . use no electricity . . . have no wires or electrical connections . . . do not heat under any conditions. And work may be held as long as desired. Convenient controls give positive holding . . . and instant release. No danger of work flying off due to a power interruption. Useful in either wet or dry grinding or machining.

For sale only in U.S.A. and its Territories. Write for detailed information on Rotary Model Permanent Magnet Chucks in 5", 7" and 9¼" diams., and Rectangular Models in 6 sizes from 2 7/16" x 5¼" to 12⅛" x 36". Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

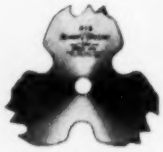


FOR INTERNAL GRINDING Simple machining operations on small parts often can be done faster and easier on Rotary Model Permanent Magnet Chucks. Work held or released with a quick 90° turn of a handle.

We urge buying through the Distributor

BROWN & SHARPE

For maximum hardness and minimum distortion



Outside cutter of Disston D-15 Dado

DISSTON MANSIL TOOL STEEL

Deep hardening, Non-deforming, Uniform

Die and punch of Mansil Tool Steel used in the making of 5½" dia. D.do cutters from annealed 53-75 steel containing .70/.85 carbon and .61/.80 manganese. Raw material is .109" thick, finished .093".

Disston Mansil Tool Steel is one of the most dependable tool steels ever produced. You can rely fully upon it in forging, machining, grinding and heat treatment. Exceptionally well suited for making intricate shapes and wherever varied cross sections must be deeply hardened.

Because of its non-deforming characteristics in hardening, good machinability and long life, Mansil Tool Steel is specified for blanking and forming dies used in the production of thousands of steel specialties. It can be annealed very soft, with small, well spheroidized carbides. Upon correct heat treatment, this structure changes to a fine martinsite . . . the fracture grain, too, will be fine, ranging from 9 to 10 Shepard.

Use Mansil Tool Steel for dies, punches, broaches, forming shears, gauges, hobs, reamers, taps, test plugs, master tools and similar applications.

ANALYSIS OF MANSIL TOOL STEEL

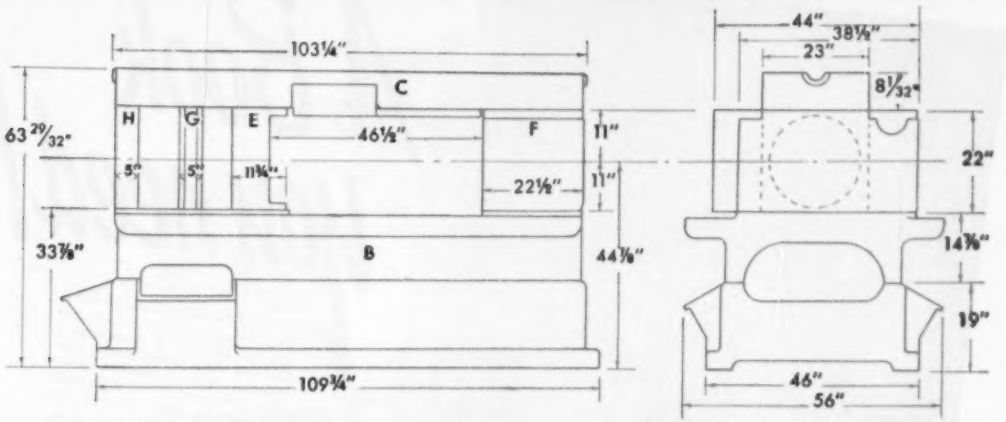
Carbon	.90%	Chromium	.50%
Manganese	1.15%	Tungsten	.50%

•

DISSTON ENGINEERS AND METALLURGISTS will be glad to help you solve any of your tool steel problems.

STEEL—Everybody who wants to obtain steel can help himself to get it by immediately starting scrap into the channels that serve steel mills.

HENRY DISSTON & SONS, INC., 820 Tacony, Philadelphia 35, Pa., U. S. A.



H, G, E — HEADSTOCK SUPPORTS Weight — 1233 lbs. | **B — BASE** Weight — 6655 lbs. | **C — TOP BED** Weight — 1232 lbs. | **F — GEAR BOX** Weight — 841 lbs.

BE VALUE WISE OR OTHERWISE

True of any "means goods," the purchase price of any Multiple Spindle Bar Automatic is only relative. It is "high" or "low" on the basis of the total cost of its total services, compared to other brands. Important items of total cost are those of operation and maintenance.

Machine analysis will invariably disclose the low cost operation and maintenance features that have been "built into" a machine. Such features are built into the CONOMATIC, beginning with its very foundation. The figures above substantiate the claims below.

THE 1½" Six Spindle MACHINE FRAME:

1. **Provides greater capacity for handling work.** — *The Frame provides a LONGER TOOLING AREA, with more positions and accommodations for tooling and attachment applications, with more clearance and conveniences for faster tool setting, than are provided by any other "automatic."*

2. **Provides better support to work and tools.** — *The Frame provides better support and alignment to headstock members, tool slides, and other units and mechanisms, with BASE SUPPORT CLOSER TO THE WORK AXIS, with BETTER TOP BED SUPPORT TO SHORTER, "WEAVE PROOF," UPRIGHTS, and, with larger, heavier, and stronger, Top Bed and Base, than are provided by any other "automatic."*

3. **Provides greater accessibility for lower cost operation and maintenance.** — *The Frame provides a more orderly arrangement of, and easier access to, all units, mechanisms, parts, and adjustments, than can possibly be provided by any "automatic" that does not have a VISIBLY ACCESSIBLE, NON-INTERFERING CAM SYSTEM.*

Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

A Book you need!

National Erie offers bulletin No. 3 1950 revised edition — a standard procedure in determining the size and horsepower capacities of gears of different materials. 24 pages of valuable engineering data. Yours for the asking!

NATIONAL ERIE CORPORATION

ERIE, PENNSYLVANIA • U. S. A.

Planning

Pattern Making

Mold Making

STEP-BY-STEP

Pouring

X-ray Inspection

Final Check

ECLIPSE-PIONEER *Foundries*

LEAD THE WAY TO BETTER CASTINGS

It is only natural that castings from the Eclipse-Pioneer Division Foundries are *better*, because every step in their manufacture is carried out by skilled craftsmen—each man an expert in his field and each field backed by more than 20 years experience. In addition to using the most modern machines, techniques and testing devices obtainable, the entire production line is conveyorized to assure rapid and economical service on all orders. If you plan to use aluminum and magnesium castings in your product, make it a point to consult Eclipse-Pioneer. Meanwhile, send for Eclipse-Pioneer's "Book of Facts."

ALL
Aluminum and Magnesium Alloys
Including the recently developed
Cerium and Zirconium Magnesium Alloys

PLEASE SEND ME THE ECLIPSE-PIONEER "BOOK OF *FACTS*" ON MAGNESIUM, ALUMINUM AND BRONZE CASTINGS.

NAME _____ TITLE _____

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CITY _____ ZONE _____ STATE _____ AM

AND PRECISION (±.005")

PLASTER MOLD CASTINGS

ECLIPSE-PIONEER DIVISION FOUNDRIES
BENDIX AVIATION CORPORATION
TETERBORO, N. J.

Bendix AVIATION CORPORATION

PROTECT YOUR GEAR CUTTERS BY CENTRIFUGING THE OIL

You save more than the cutting oil when you remove metallic chips by means of De Laval Centrifugal Oil Purifiers. You add to the life of the machines and tools and — very important — you insure faster, more accurate work.

Cutting oil is only one of the many kinds of factory oils that may profitably be purified by centrifugal force. Sometimes the problem is one of clarifying an oil, sometimes it is one of dehydration. On either score, De Laval machines provide a most satisfactory means of doing the job.

Where there are opportunities to purify various oils in scattered locations, a Portable may be indicated. Sometimes a centralized system is the most economical means of keeping oil clean.

IT PAYS TO CENTRIFUGE ALL OF THESE FACTORY OILS

Quenching Oil
Increases oil life. Eliminates "soft spots" due to moisture.

Slushing Compound
Enables rust-preventing compound to give full protection.

Cutting Oil
Oil can be re-used safely indefinitely. Less dermatitis. Increases tool life.

Test Oils
Tests are more reliable. Oil can be re-used indefinitely with perfect safety.

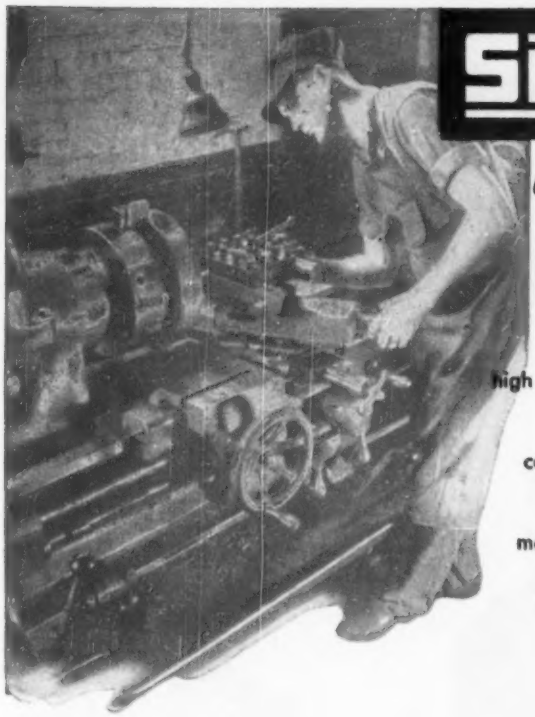
Hydraulic Oil
Eliminates rusting. Saves pumps and control mechanisms. Minimizes valve sticking. Prevents hardening of seals.

Miscellaneous Oils
Honing, shock absorber, washing oils are among the many that benefit from being centrifuged.

DE LAVAL

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

PURIFIERS AND CLARIFIERS FOR FACTORY OILS

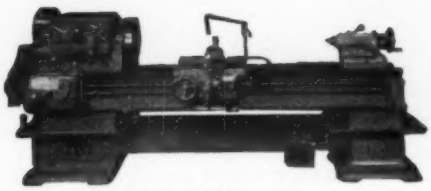


SPRINGFIELD

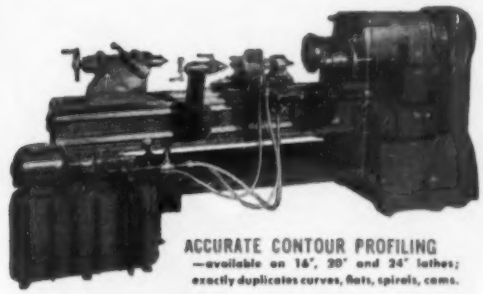
Geared Head
LATHES

Springfield builds a complete line of precision, high quality, geared head lathes. Every type of lathe built by Springfield is especially designed and constructed to meet all the requirements of modern tooling, and to retain extreme accuracy through many years of full capacity production.

Write for catalogs and detailed specifications.

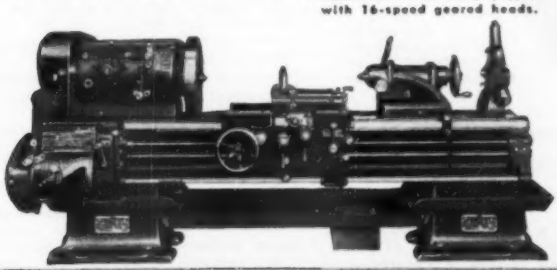


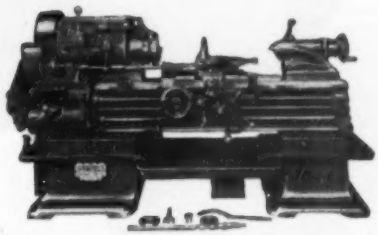
MANUFACTURING LATHE
—with unusually wide applications; capable of accurately turning, boring and facing.



ACCURATE CONTOUR PROFILING
—available on 16", 20" and 24" lathes; exactly duplicates curves, flats, spirals, cams.

SUPER DUTY LATHES
—made in 20" and 22" sizes; equipped with 16-speed geared heads.





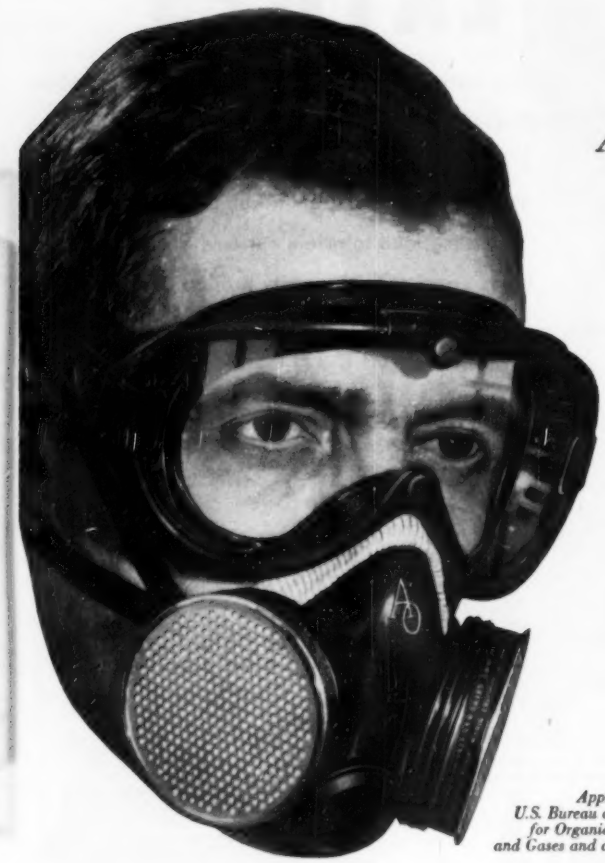
TOOL ROOM LATHES
—made in all sizes including 24"; equipped with lead screw reversing mechanisms.

THE SPRINGFIELD MACHINE TOOL COMPANY
SPRINGFIELD, OHIO, U. S. A.
GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6
Exclusive Representatives in All Principal Cities

Instant Acceptance!

AO
R5000 LINE of
Twin Cartridge
Dust, Gas, Vapor
Respirators

AO's "7 Respirators-in-1" simplifies protection, offers many advantages



Approved by U.S. Bureau of Mines for Organic Vapors and Gases and all Dusts

Ring accepts either chemical cartridge or dust filter assembly

QUICK FACTS NEW THREADED CARTRIDGES—Wider, for lower breathing resistance. To interchange, merely unscrew one cartridge and screw in another for gas-tight seal.

NEW FILTER RETAINER ASSEMBLY — Takes either chemical cartridges or flat disc of chemically treated felt.

NEW FACE PIECE— Non-leaking, snug fitting, comfortable, of durable, pure rubber.

SUPERIOR VISUAL AREA—New slender cartridge design and lower location of cartridge afford wider field of vision.

NEW FLEXIBLE FITTING BRACE—Face piece adapts to features of wearer by slightest hand pressure on brace for perfect fit. Headband pressure cannot pull pliable rubber face piece out of shape.

NEW INHALATION AND DRAIN VALVE DESIGNS—Provide positive action, thorough drainage and no interference by clothes or face.

NEW INVENTORY ECONOMY—"7 respirators-in-1" permits standardization, hence smaller inventories.

Double length headband permits "parking" of respirator around neck when not in use. Auxiliary filters available which extend cartridge filter life.

Announced only recently, the AO R5000 line of Twin Cartridge Respirators featuring new *interchangeable* cartridges and disc filter, has already been widely acclaimed for the ease with which it solves varied respiratory problems. Using a single face piece, the equipment quickly converts to the type of gas or vapor respirator required—with a chemically treated felt filter for dust protection.

Your nearest AO Safety Products Representative can supply you

American Optical Company
SAFETY PRODUCTS DIVISION

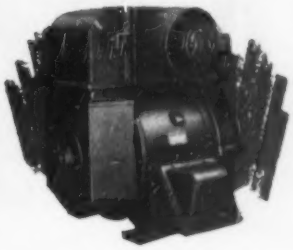
Southbridge, Massachusetts • Branches in Principal Cities

save installation cost

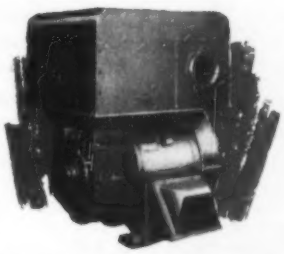
G-E unit-cooled motors keep on the job on this diesel-engine cylinder-boring machine.

unit-cooled D-C MOTORS

2 types to meet your needs



SINGLE-BLOWER TYPE—
for normal speeds has shaft-driven fan to circulate internal air, and separate motor-driven blower for external air.



DOUBLE-BLOWER TYPE—
can be operated continuously at very low speeds without harmful overheating. Auxiliary induction motor drives blowers for internal and external air.

Here's Protected Power For Harmful Atmospheres . . . Unit-Cooled D-C Motors From 15 to 200 Hp

G-E unit-cooled motors eliminate need for pipes, ducts, or external cooling systems.

Easy maintenance! Special heat-exchanger and ventilating system keep airborne particles out of the motor. Large end-shield openings provide easy access to commutator brushes and brush rigging.

Flexibility! You can interchange these motors easily with G-E open motors, because they have the same mounting dimensions.

You can buy G-E unit-cooled motors from 15 to 200 hp, for constant or adjustable speed. Ask your G-E representative or write for Bulletin GEA-4469. Apparatus Department, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC

770-20

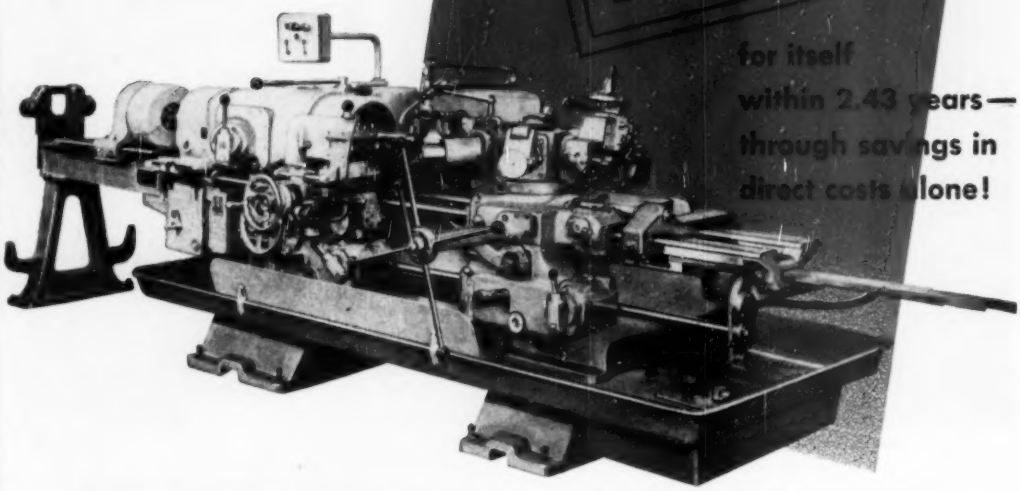
41% DIVIDEND

THE FIRST YEAR*

This Jones & Lamson Turret Lathe will have

PAID

for itself within 2.43 years—through savings in direct costs alone!



*Any investment which produces a 41% dividend the first year is worth looking into! The savings which produced this dividend were revealed by our analysis of a manufacturer's actual turning operations.

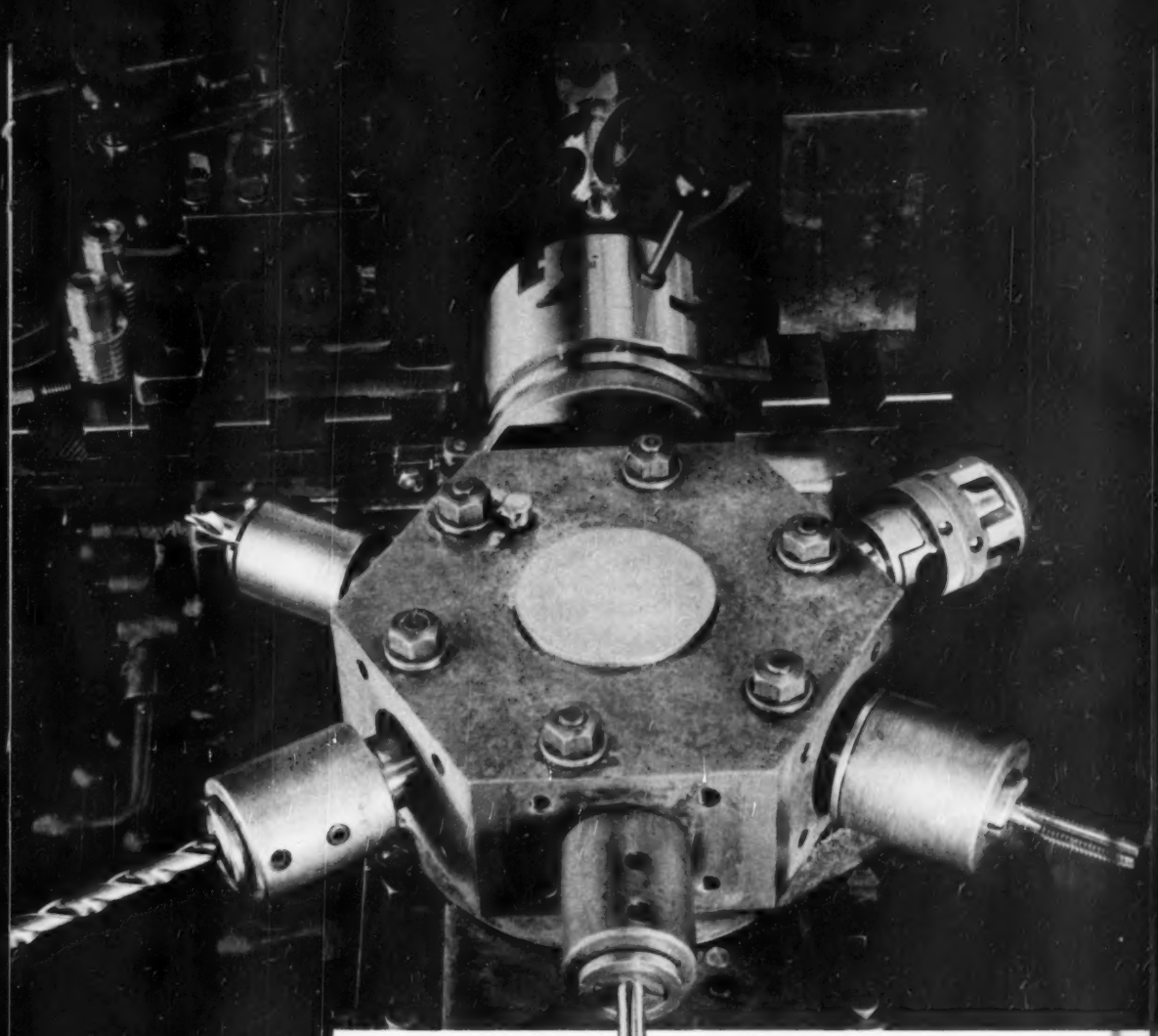
ARE YOU EQUIPPED TO YOUR BEST ADVANTAGE? Get a free check-up on your present operations. Write to our PRODUCTION RESEARCH DEPARTMENT for this service.

Investments in cost cutting, up-to-the-minute equipment can pay handsome dividends in money savings and improve your competitive position as well.

Turret Lathe Division

J&L JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835



and gages too!

Yes, only GREENFIELD with its GEOMETRIC Division manufactures in its own plants, a complete line of Cutting Tools plus Gages! Yes, only GREENFIELD could duplicate the above tooling and top it off with all necessary Gages.

REGULAR STOCK ITEMS

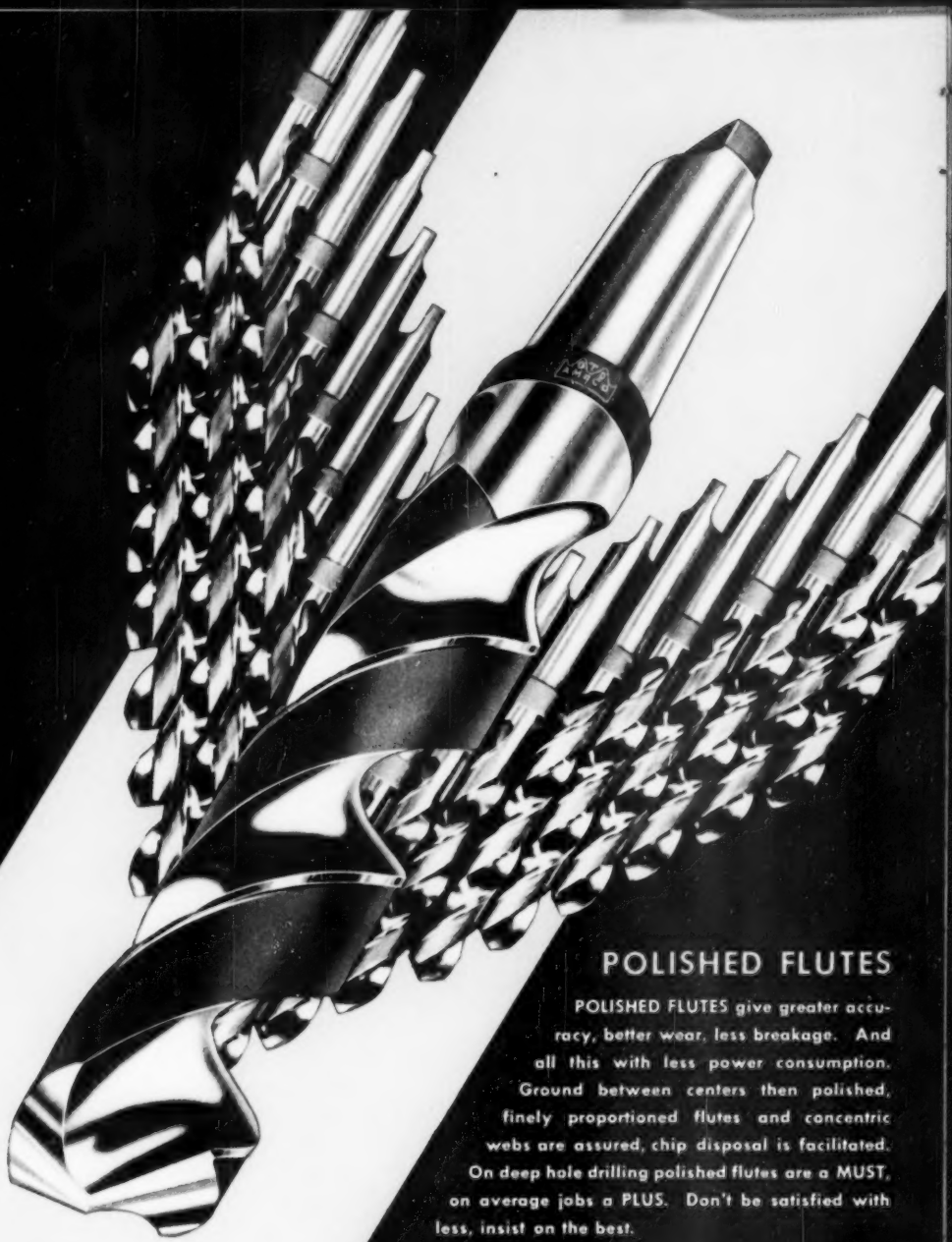
	Capacity From	To
TAPS and COLLAPSING TAPS	0-80	8½"-8
DIES and DIE HEADS	0-80	6"-7
GAGES—THREAD	0-80	1½"-6
GAGES—PLAIN	.059"	4.510"

	Capacity From	To
DRILLS	#80	3½"
REAMERS	7/0	2½"
END MILLS	1/16"	2"

BUY TOOLS WITH **CONFIDENCE** BUY **GREENFIELD** TOOLS

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS



POLISHED FLUTES

POLISHED FLUTES give greater accuracy, better wear, less breakage. And all this with less power consumption. Ground between centers then polished, finely proportioned flutes and concentric webs are assured, chip disposal is facilitated. On deep hole drilling polished flutes are a MUST, on average jobs a PLUS. Don't be satisfied with less, insist on the best.

GTD AMPCO

BE SURE BUY GTD-AMPCO

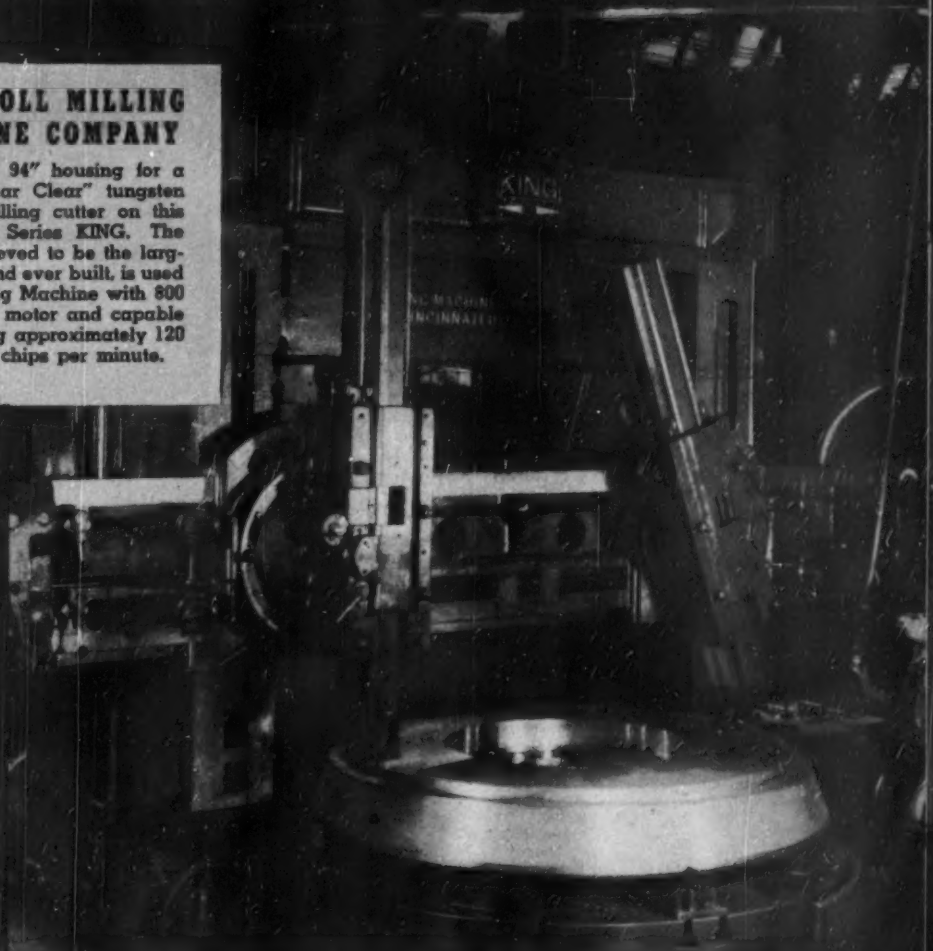
AMPCO TWIST DRILL DIVISION
GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS

BIG THINGS ARE BEING DONE BY KING

VERTICAL BORING & TURNING MACHINES

INGERSOLL MILLING MACHINE COMPANY

turned the 94" housing for a giant "Shear Clear" tungsten carbide milling cutter on this 100" New Series KING. The cutter, believed to be the largest of its kind ever built, is used on a Milling Machine with 800 H. P. drive motor and capable of removing approximately 120 bushels of chips per minute.



New savings in machining time, increased production, improved quality of work—these, too, are "big things" being accomplished by KING Vertical Boring & Turning Machines the nation over . . . Ten sizes: 30", 36", 42", 52", 62", 72", 84", 100", 120", and 144" . . . New catalogs now available. When writing, specify size machines which your work requires.

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

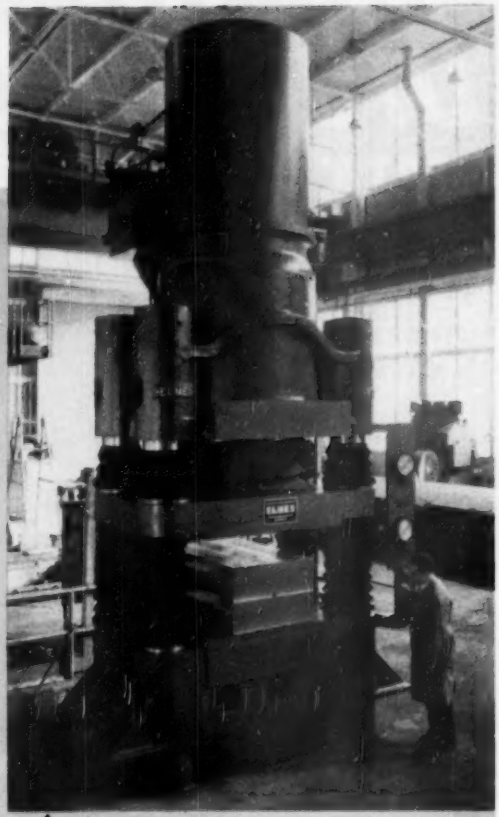
ELMES builds

- a wider range of hydraulic press types and sizes
- with outstanding production economies

in NEW Ultra-Modern Plant

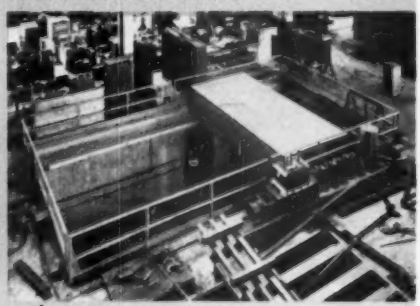
• In the large, modern plant shown below, equipped with the most advanced production facilities, Elmes is now building *much larger* presses and other hydraulic equipment in an *even wider range of types and sizes* than was possible before. And—with far greater economy. Now, more than ever, it will pay you to "Put Your Pressing Problems Up To Elmes."

You can't afford to keep outmoded machines on your payroll: they're too expensive—in low output, in high production and maintenance costs. Replacement with modern equipment is your BEST profit insurance. It will pay you to investigate the production potential of modern, high-efficiency Elmes Presses.



▲ This 2000-ton Elmes Abrasive Wheel Forming Press is one of the first large units produced in Elmes' new plant. The press is lever-controlled with two pressures available. Rugged construction assures minimum deflection.

▼ Aerial view of the new Elmes plant—one of the finest in the industry. The most modern precision production equipment and extensive working areas make possible the building of Elmes Hydraulic Presses in a greater variety of types and sizes, both standard and special designs.



▲ A view of the new Elmes assembly pit for erecting presses of unusual height. Sectional pit covers permit simultaneous erection of several normal-height presses having sub-floor assemblies.

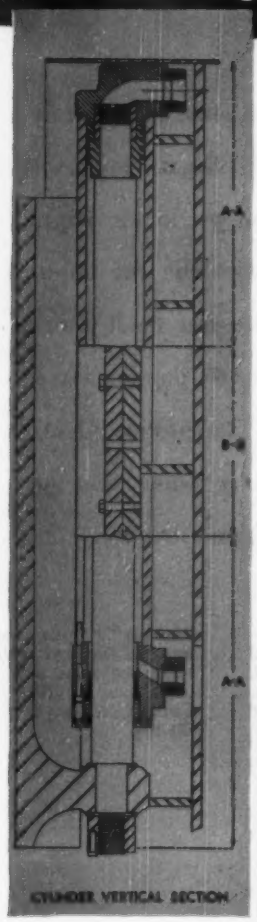
AMERICAN STEEL FOUNDRIES • ELMES ENGINEERING DIVISION

Distributors in Principal Industrial Centers — *Also Manufactured in Canada*

1150 Tennessee Avenue, Cincinnati 29, Ohio

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

What engineering features are responsible for LAPOINTE LEADERSHIP in building BROACHING MACHINES?



CYLINDER VERTICAL SECTION

HERE'S A LIFETIME CYLINDER!

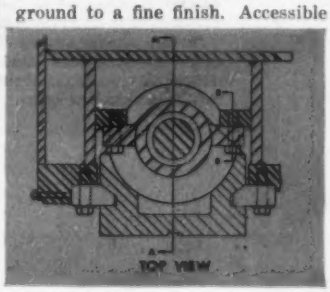
TAKE A LOOK at this drawing and see for yourself what Lapointe engineering has accomplished, in building genuine two-fisted *ruggedness* into the cylinder of a vertical broaching machine.

The cylinder is made in *one* welded steel construction with side rails extending the full length. These are rigidly bolted and doweled to the frame — forming a remarkably strong shallow U-section which *cannot spring under the most severe load conditions.*

THE CAST IRON PISTON has diesel engine-type piston rings. The rod is carburized hardened and ground to a fine finish. Accessible bronze bushings and a standard packing gland form an excellent seal.

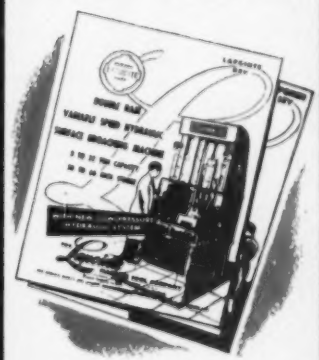
Cylinder caps are fitted with O-rings for permanency.

This construction permits ZERO-MAINTENANCE on the cylinder!


TOP VIEW

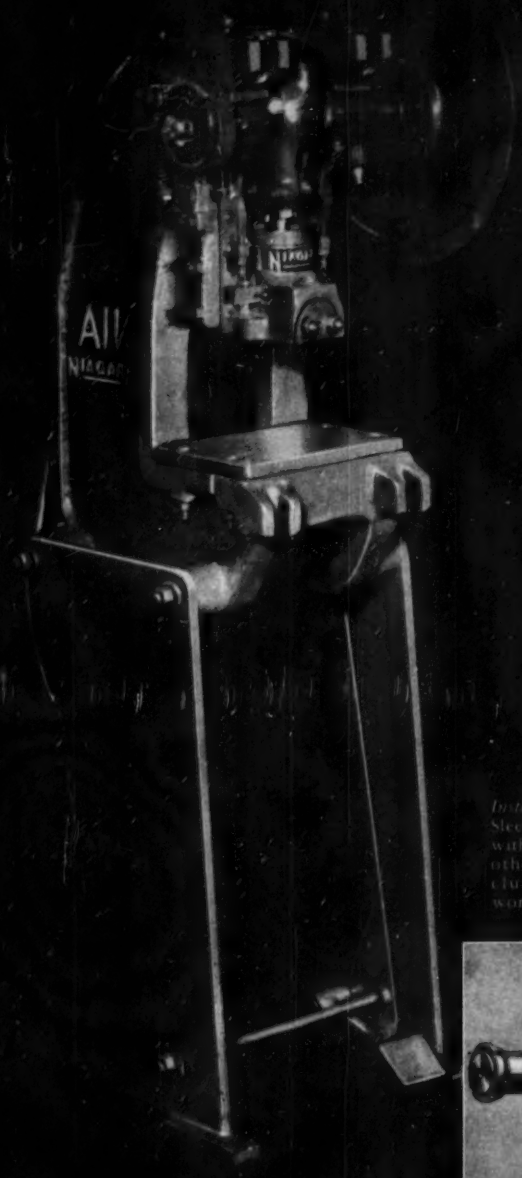
LAPOINTE takes the responsibility for the entire job — machines, tools, and fixtures. That's a big reason for Lapointe Leadership . . . that's why "Lapointe's the way to *better broaching!*"

COMPLETE ENGINEERING DATA and dimensions on double ram and single ram LAPOINTE Vertical Broaching Machines will be found in these two illustrated bulletins. You are invited to send for Bulletins DRV-2 and SRV-2.



LAPOINTE Vertical Broaching Machines are all built to JIC Standards at no extra cost.

THE Lapointe MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
Branch Factory • Edgware • Middlesex • England
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

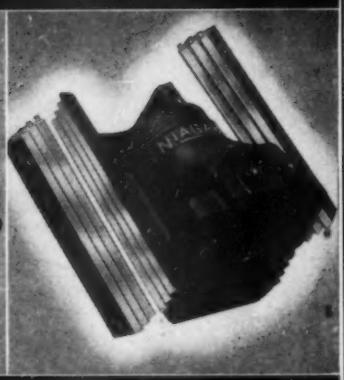


ONLY

● You get the same advanced design in small Niagara Inclinable Presses as you get in the largest sizes. Don't overlook the importance of this because small presses run as much as 6 times as fast as large presses. Regardless of size you get quality when you get Niagara Inclinable Presses.

Instant Engagement of the Sleeve Clutch as compared with the slower action of other mechanical press clutches produces more work strokes per hour.

Multiple 1" gibs provide more guiding surface which minimizes wear, maintains alignment of slide with bed and thus increases die life.



NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

NIAGARA

SMALL INCLINABLE PRESSES

Give you all these

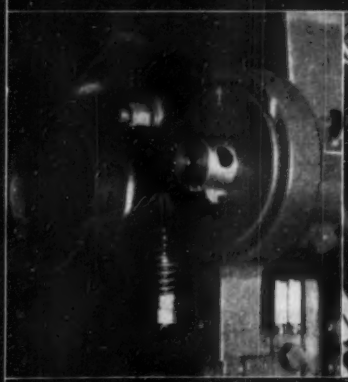
BIG PRESS FEATURES

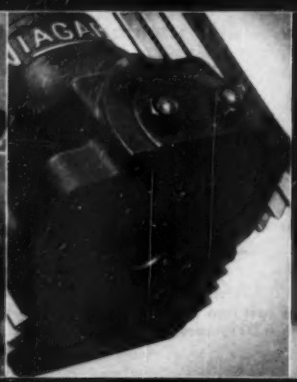
Brake automatically compensates for wear as well as expansion due to heat of operation. Drum and band marked to indicate correct adjustment.

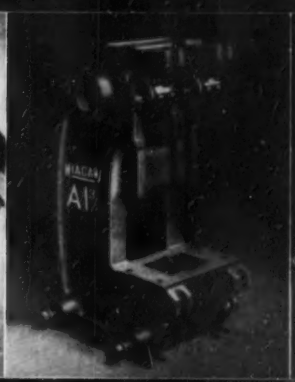
Steel destressed to assure solid backing for die from center to front as well as rear. Breech block slot clamp gives solid backing to punch shoe.

Steel destressed to provide solid gib mountings of strength in the crankshaft to strong and a rigid gap maintaining close alignment of punch and die.

Indirect mechanism operated by one hand. Working lengths is not materially changed when press is inclined.



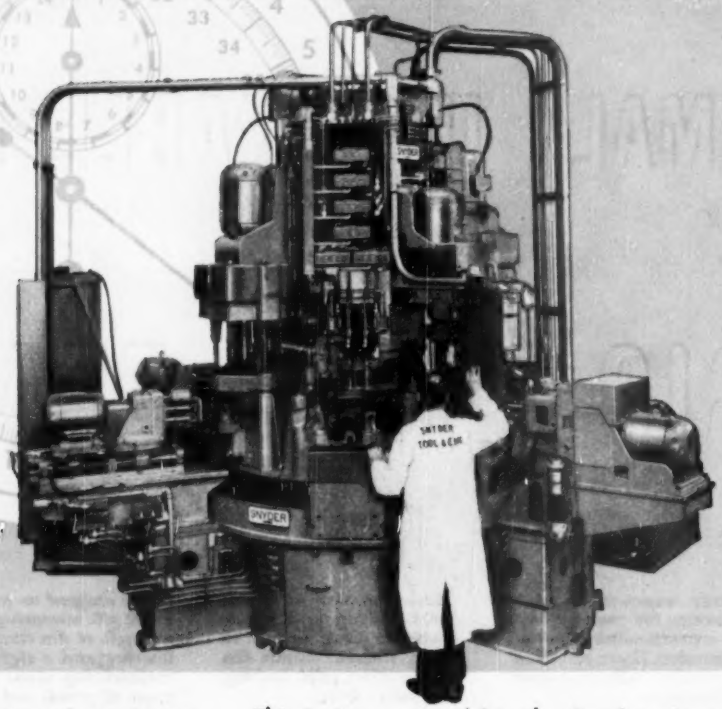




DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

SNYDER *Delivers*

31 WORKING DAYS FROM FINAL RELEASE OF FIXTURE AND UNIT DETAILS UNTIL FIRST TEST PIECE WAS RUN



When changing specifications keep important units on the drafting boards and the projected delivery date races closer and closer—then's when shop capacity, equipment, and most of all, human know-how really count.

This big machine, scheduled within tight limits, went through on time despite changes.

This isn't exceptional in the Snyder plant—it's standard practice. And, although we don't invite rush work, we know that some of our friends think of us first when the heat's on.

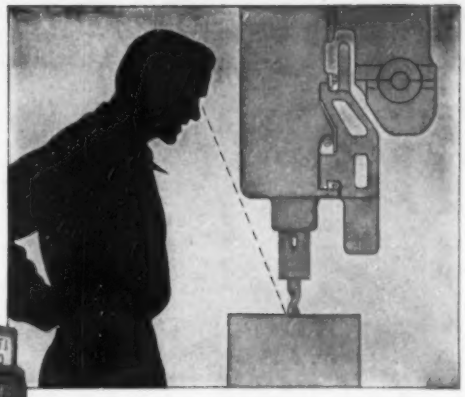
Why don't you give us a call on those new machines you're planning. You'll like knowing that you'll get them on time.

The machine shown is one of a battery for processing a cast iron converter housing. It drills, chamfers, reams, counterbores or taps 51 various size holes at various angles in a 31½ second work cycle at six stations. It is fully automatic.

SNYDER TOOL & ENGINEERING COMPANY
3400 E. LAFAYETTE, DETROIT 7, MICHIGAN

A Quarter Century of Successful Cooperation With Leading American Industries

Powerful-



With the arm low or high, the operator always sees the work. Note the very slight projection of the Cincinnati Bickford head beyond the spindle.

Safe-Versatile-

Very powerful—very rigid—and yet extremely easy to handle.

All controls on the head low and close to the operator's hands, saving physical effort and giving the operator a clear view of the work on all jobs.

Outstanding safety features include Safety Elevating Nut, Spindle Catch, Power Rapid Traverse Safety, Feed Safety Clamping and Elevating Safety Interlock.

36 speeds and 18 feeds (4 speed ranges are optional) give a wide range of performance and versatility.

You may expect a sustained quality of work and fine production from these machines.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE

Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

Write for Bulletin R-29, and check the outstanding design and construction features.

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

don't scrap metal by turning!

...save by Swaging

on

The Torrington Rotary Swaging Machine uses every bit of stock. With 4000 hammer blows a minute, swaging reduces, sizes, rounds, tapers and points rod, wire and tubing. It makes metal tougher and more resilient. It hammers away minor surface defects.

Torrington Swagers are built to a mechanical perfection based on our 42 years' swaging experience. Send today for your free copy of the illustrated booklet describing the machine and the method.

THE TORRINGTON COMPANY
Swager Department
539 Field Street • Torrington, Conn.

Send the coupon today for your free copy of this booklet.

Please send a copy of "The Torrington Swaging Machine" to:

Name_____

Firm_____

Address_____

Backlash

Knuckling Characters

In June 12 *AM* you have an article about a machine for making characters for the Monroe calculating machines. This is a very old but usually secret process, even older than the 1906 date mentioned as the patent date.

In our business of steel-stamp making, we call it "knuckling." Having built three or four different kinds of knucklers, I decided to settle on a simple, foolproof machines, and sell them to steel-stamp manufacturers. This was about two years ago, and I have sold several of them at $2500 each. We knuckle high-carbon and high-speed tool steels.

H. C. RICKENBACH, PRESIDENT,
Pittsburgh Stencil & Tool Co.
Pittsburgh, Penna.

1884 AM Available

In 1884 I went to learn the machinist trade in Reading, Pa. I have worked at the trade since then until last September when I was forced to go to the hospital for 6 weeks. I have not worked since and do not expect to work any more, but my health is fine. I am now 82 years old but still very much interested in things mechanical. I have the *American Machinist* for the year 1884, all numbers complete with ads and index, bound. I would be willing to dispose of it to anyone interested.

How the magazine has changed! That was a steam age, not an electric one.

Robert E. Riegner
133 Chestnut Street
Mohnton, Pa.

Education an Answer

Many of our workers are happy when they are on the receiving end of life. With great interest, they follow any act or regulation that is to their advantage.

They feel that all corporations make huge profits, and constantly complain that they are not getting their share. It is unfortunate that many of our workers do not have the wide-range vision to see that happiness is not *bestowed* on us. It is unfortunate that they do not have the ability to recognize the common good.

We must all contribute by giving more often to the enrichment of life. We must educate our workers to the fact that none of us get something for nothing. We need to give honest explanations as to who pays the bill. Certainly the government, in the long run, cannot give as much as it takes out of the workers' pockets.

Although our people have recognized that Communism is brutal, we now have Socialism, which is not very different. In fact, it's the same thing in less of a hurry.

We have got to learn, practice, teach, and educate our workers to what is good for all of us. Certainly our businessmen must do something about the way things are going.

It's clear that all of our politicians think that the majority of our adults are so misinformed, they believe in a free lunch—in fact, they demand it. The politicians—no matter what their personal convictions are—think the public would not understand or support them if they talked and acted soundly.

I can think of no better way to teach and educate for the good of the nation as a whole, than through business publications like those of McGraw-Hill.

A. E. Salmons
Philadelphia, Pa.

Diamonds for Truing

Referring to "Dressing and Truing Grinding Wheels" (*AM*—Dec. 29, '49, p77), we feel that two major points in connection with the chart, "Basic Factors in Determining Diamond Size," are worthy of mention. We fully agree with the increased significance given to the width of the wheel in comparison with diameter in arriving at the factor rating, but feel that the factor ratings allocated to grit, grade, bond, and abrasive are rather high. These four factors should be the subject of quality rather than size of diamond, as we fail to see the relationship between hardness of the

Hydrohoner equipped with automatic MICRO-SIZE control Microhoning small-diameter holes in long parts.

Double-Spindle Hydrohoner shown Microhoning large-diameter, short bore. Electronic-MICRO-SIZE control is interlocked with automatic indexing table to give automatic operation.

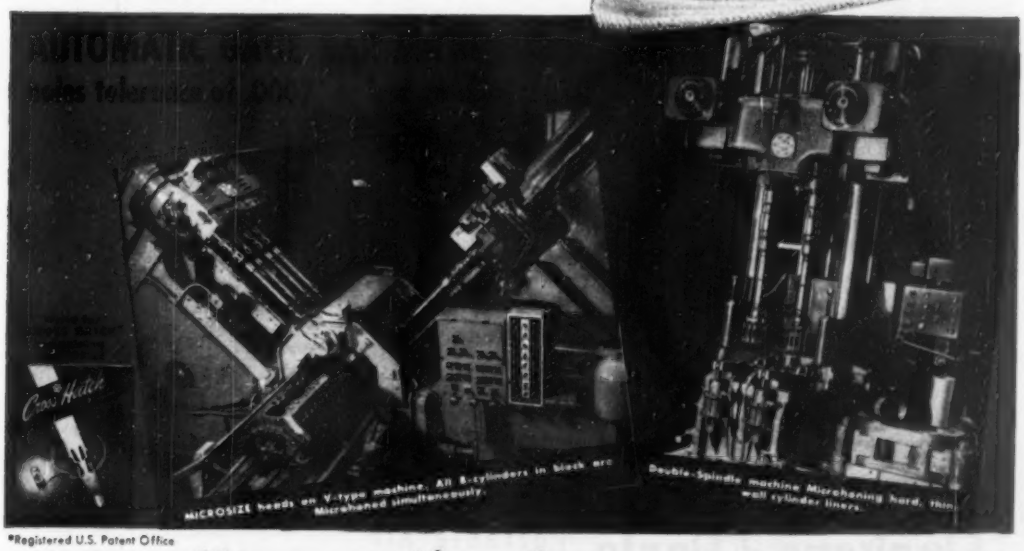
INCREASED PRODUCTION

FROM MORE ACCURATE, MORE CONSISTENT CONTROL OF SIZE . . .

MICROSIZE—AUTOMATIC SIZE CONTROL adaptable to bores of any diameter or length. Electronic control automatically stops operation when bore is Microhoned to desired size. Tool feed-out is adjusted automatically.

Reduces:

HANDLING
INSPECTION
SCRAP
SELECTIVE FITS
RE-RUNS



MICROSIZE heads on V-type machine. All 8-cylinders in block are Microhoned simultaneously.

Double-Spindle machine Microhoning hard, thin-wall cylinder liners.

*Registered U.S. Patent Office

Micromatic Hone Corporation 8100 SCHOOLCRAFT AVENUE DETROIT 4, MICHIGAN

District Field Offices: 1323 So. Santa Fe., Los Angeles 21, California • 614 Empire Building, 206 So. Main St., Rockford, Illinois
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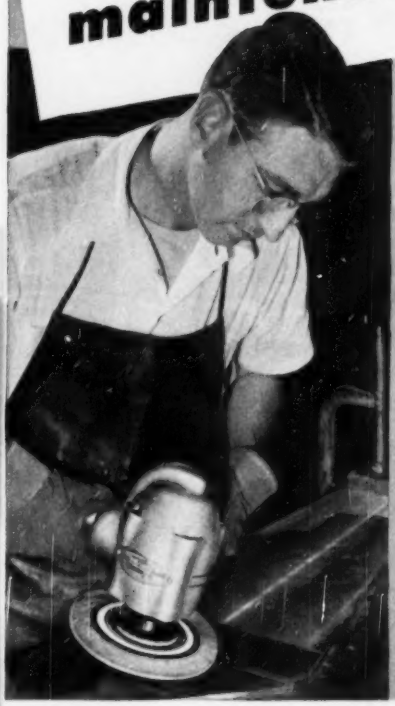
for **production** and **maintenance** work



NORTH AMERICAN AVIATION uses BUCKEYE vertical sanders

• On production work—removing machine marks from the tapered wing section of an F-86 Sabre jet fighter . . . on maintenance work—preparing the top surface of a drill press table prior to brazing . . . the versatile, efficient Buckeye Vertical Sander does the job for North American Aviation, Inc.

On your job—whether it calls for a sander, grinder, buffer . . . drill, screwdriver, nutrunner . . . wrench, shears or nibblers . . . there's a lightweight, easy-to-handle Buckeye Air Tool, packed with power to save time and money. The new Buckeye

Air Tools Catalog tells the complete story—write today, without obligation, for your copy.

Buckeye Tools CORPORATION
DIVISION 15 • DAYTON 1, OHIO

Portable Air and Electric Tools for Industry

wheel and size of the diamond, once a suitable minimum has been ascertained . . . It has been proved, however, that the quality of diamond from hardness consideration has a distinct relationship to the hardness of the wheel.

Secondly, we do not think that we are being too severe in saying that the days when an operative lavishes every care and attention on the tools he uses are passing. This applies to all tools, not only diamonds. In our opinion, the final determination of diamond size and quality must take into consideration not only the factors set out, but also the average scale of the operatives in the particular factory, as this influences over-all costs. It is well known that the largest and finest of diamonds can be broken through carelessness, proving a very expensive proposition. On the other hand, a lower-priced diamond may not be perfectly sound, and so the possibility of fracture is increased, while the cost of the occurrence is reduced.

In ordering diamonds, it is of considerable help to the supplier if the customer indicates, and invites the cooperation of the manufacturer, where breakages are frequent.

R. ALLEN
Technical Director,
Engineering Diamonds, Ltd.,
England

Power Declines 2%

In "Are We Slowpokes at High-Speed Machining?" (*AM*, March 6), you make the statement that power requirements decline at high machining speeds. We have made tests up to speeds of 1500 fpm with carbide tools on steel and found that power requirements (in terms of hp per cu in. of metal removed per min) do decline steadily as cutting speed is increased. However, the rate of decline is slow, amounting to about 2% drop for each 100 fpm increase in cutting speed. This rate of drop is roughly constant for a variety of types of steels commonly machined. Therefore, we question the very considerable decline in power requirements indicated by the figures given in your article. M. EUGENE MERCHANT, *Senior Research Physicist, The Cincinnati Milling Machine Company.*

GET A *Head Start* WITH FEDERAL GAGES

When you need a gage to do a job that the usual catalog-type gage won't handle, you'll save time and money by consulting FEDERAL. We probably have the Gage to fit your special requirement.

In addition to our regular catalog Gages, we have many different stock parts and sub-assemblies ready-built—ready to assemble into a Gage that's right for your job. That's the head start you get with FEDERAL. *You save time.*

We also have thousands of gage designs (over 20,000). Experience tells us that these designs will answer almost every dimensional control problem—even problems which may look very special from where you sit. For instance, you may want a crankshaft gage, but you won't find it in our catalog even though we have made plenty of crankshaft gages. If we included every Federal Gage, our catalog would be too big for handy use. The list at the right represents only a few of the thousands of available Federal Gages.

You also save money. Federal Gage Components are quantity-produced and Federal experience saves your experimental costs. One-of-a-kind gage-making jobs can be bothersome and costly. *You save worries too.* You get the full benefit of the experience we've gained building thousands of Gages for thousands of gage requirements . . . for all types of dimensions.

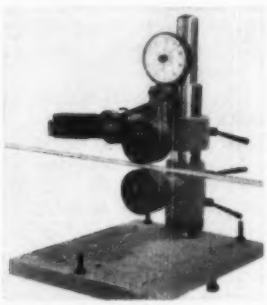
No catalog could adequately cover the full line of completed Gages, Gage Sub-Assemblies, and Gage Components in the Federal inventory. We'll gladly show you, without obligation, how our inventory, experience, and knowledge can solve your gaging problems. Write today . . . get a head start with FEDERAL Gages. **Federal Products Corporation,** 1128 Eddy Street, Providence 1, Rhode Island.

THIS LIST REPRESENTS ONLY A FEW OF THOUSANDS OF FEDERAL GAGES WE HAVE DESIGNED AND BUILT.

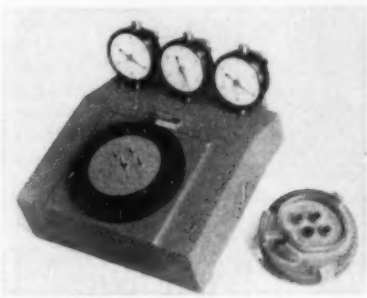
Alignment	Keyway
Angle	Length
Bellmouth	Lens
Bevel	Location
Bore	Miscellaneous Types
Caliper Gages	Multiple-Inspection
Chamfer	Offset
Circumference	Out-of-Round
Combined Measurements	Outside Caliper
	Outside Diameter
Comparators	Parallelism
Compressibility	Penetration
Concentricity	Plug Gages
Continuous	Position
Contraction	Pressure
Curvature	Progressive Gages
Cylinder	Recess
Density	Rifling
Depth	Run-Out
Distance	Screw Threads
Eccentricity	Slots
Elongation	Snap Gages
Expansion	Spacing
Extension	Spline
Flatness	Squareness
Gears	Straight-line Progressive
Grinding Gages	Straightness
Gun Bore	Strain
Hardness	Taper
Height	Tension
Hole	Thickness
Inside Caliper	Thread Lead
Inside Diameter	Thread Pitch Diameter
Journals	Width

INTERNAL THREADS
Model 1242 P-6 checks pitch diameter. Contacts retract for more positive, faster application.

INSULATED WIRE
Model 22 P-158 checks O.D. and wall thickness of rubber insulation. Approved by Fire Underwriters.



CONTINUOUS MEASURING
Model 493 B-56—Gages are available for continuous checking of steel, glass, rubber-covered wire, etc.



HOLE LOCATION
Model 247 B-174 is one of many hole location gages. It's a cinch with FEDERAL.

FOR EXPERT ASSISTANCE ON GAGING PROBLEMS, CALL IN YOUR NEAREST FEDERAL REPRESENTATIVE. OFFICES LOCATED IN FOLLOWING CITIES:

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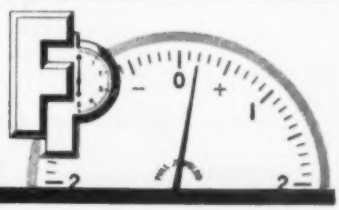
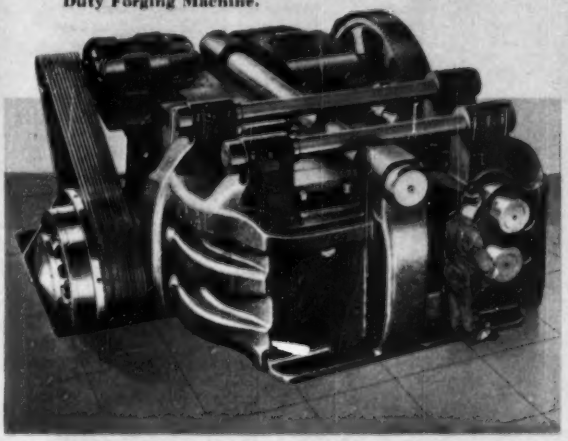
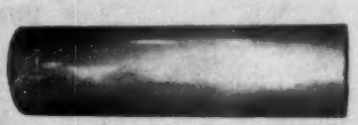


LARGE DIESEL CYLINDER LINER FORGED ON NATIONAL 9-INCH FORGING MACHINE!

Forging 230-pound Diesel Engine cylinder liners at the Canton Drop Forging and Manufacturing Company, Canton, Ohio, on a National 9-inch High Duty Forging Machine.



National 9-inch High Duty Forging Machine, preferred by the forging industry for its superior rigidity, alignment, and general reliability.



Stock: seamless steel tube $35\frac{11}{16}$ inches long, with an outside diameter of 10 inches and a wall thickness of less than one inch.

Finished forging, showing large amount of gather from original tubing blank.

● An interesting technique for forging large cylinder liners for Diesel Engines is being employed by the Canton Drop Forging and Manufacturing Company of Canton, Ohio.

Stock for these cylinder liner forgings consists of a seamless steel tube of AISI C1025 steel — (equivalent to SAE 1025), measuring $35\frac{11}{16}$ inches long.

This job is forged in a National 9-inch High Duty Forging Machine. The method previously used involved considerable machining with a great loss of stock. The upset forging method greatly reduces stock loss, increases production, and produces a much superior forging. Long-running, trouble-free operation is reported.

If you have a forging problem, let us help you apply our many years of experience toward solving it. No obligation, of course!

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TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET, AND WIRE NAIL MACHINERY

New York Detroit Chicago

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These dependable National Headers are important reasons why Timken rollers are able to pass exacting dial-indicator inspections as to taper, length, and concentricity. Twenty-one Nationals produce more than 125 types and sizes of rollers from ⅜-inch to 1¼-inch diameter wire.

Timken uses National Cold Headers because their operating features include accuracy, speed, versatility, and ruggedness.

If you have a hot or cold forging problem, let us help you apply our experience toward its solution.

NATIONAL
MACHINERY COMPANY
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DESIGNERS AND BUILDERS OF
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New York Detroit Chicago

This quality feature is STANDARD construction on all-steel shank type

DANLY DIE SETS

DANLY INTEGRAL WELDED SHANK

A new welding technique that assures 100% fusion of shank to punch holder makes this superior construction possible. Knock out holes in the shank itself or machining on the punch holder face are much less likely to effect shank strength.

Features like this make Danly the nation's leading die set producer. Check these other Danly Die Set advantages and you'll see why die makers and production men everywhere prefer Danly Die Sets:

- *prompt delivery* . . . from the nearest of the nation wide system of Danly assembly branches.
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- *broad selection* . . . the wide range of Danly standard and stocked special die sets meets nearly every tooling need.
- *Danly reliability* . . . every Danly Die Set is backed by the experience accumulated in more than a quarter century of service to the stamping industry.

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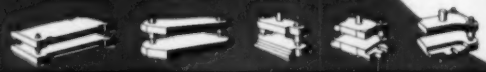

PRECISION DIE SETS . . . STANDARD AND SPECIAL

WHICH DANLY BRANCH IS CLOSEST TO YOU?

DANLY®

SPOT NEWS of Metalworking

- **New electrical standards for machine tools** and other production equipment will be pushed by General Motors for general adoption, despite war production program. GM officials feel these standards have sufficient merit to warrant such action.

- **Largest complex pieces of cemented carbide ever made** are contained in experimental gas turbine to begin initial test runs next month in plant of midwest metalworking manufacturer. The impeller, nozzle vane section and two casing halves are of carbide.

- **Copper strip has been drilled experimentally at 20,000 fpm with HSS drill** driven by a wood router head. Holes are produced faster and cleaner, it is claimed, than by punching.

- **Titanium can be drilled fairly easily,** according to report from important metalworking company. But no turning tool has yet been found that will stand up under normal tests.

Steel allocations, except for voluntary rationing by mills, are unlikely until November. Before that, users may be asked to make "inventory reports" of what they have on hand. More rigid export controls will come before steel allocations (see page 143 for detailed report on "Metalworking Mobilization," in form of 8-page Washington Defense Bulletin).

- **Fiscal 1951 will be fourth biggest year in aviation procurement history,** with $7.7 billion marked for military aircraft buying. World War II had three larger years: 1942 with $23.6 billion; 1943 with $10.4 billion; and 1944 with $22.7 billion. Industry's job in supplying Defense Department's 69 groups is much bigger than 70 groups formerly planned. Today's bomber group has 30 bombers and 15 tankers, against only 15 planes before.

- **Thread generating machine arranged so leadscrews and change gears can be interchanged** for threading screws with metric, modular or British and American pitches was shown by Cornelis of Belgium at International Trade Fair at Chicago. Machine uses cutter similar in appearance and design to those in Fellows gear shapers.

- **What to do about deferring apprentices** is one of the questions on which Department of Defense would welcome advice from industry. Non-deferment could create critical situation in industries like aircraft which must double its force the next year, and in aluminum and gray iron foundries, where exodus is apparent to cleaner, better paying jobs elsewhere.

Simple rating, such as 1, 2, and 3, for all defense orders will precede any application of the 1950 version of World War II's General Preference Order E-1-B to machine tools and other production equipment. But even a 1-2-3 rating plan, as intermediate step between no priorities and E-1-B, is not immediately ahead.

- **Expanded production of British jet fighters**—deHavilland Vampire 5S and Gloster Meteors—will absorb largest share of $280 million additional defense outlay by British government. Probable additional planes to be bought: 1,000, with spare engines.

- **Fourteen-inch swing engine lathe, with stepless adjustable speed range from 30 to 2,000 rpm** and designed for preselection of the next spindle speed during the cutting cycle, was shown at Chicago International Trade Fair. Name: the Belgian Mondiale "Selectronic." A 36-inch Gendron roll grinder (Italian), also on display, does roll camber grinding by controlling the fluid pressure in opposite sides of the bearing by cam control.

- **Newest plan is to import steel and various kinds of machinery from Germany** to help U. S. tightness in materials and perhaps in end products. Prediction: not much stir will be made by steel imports, but attempt to bring in machinery will cause roar of criticism.

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DETROIT 32
MICHIGAN

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DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington

Final cost of the present mobilization program hasn't been settled yet. Industry's defense production job already totals close to $30-billion, spread over the next two years.

Emergency requests for funds that followed close on the heels of the North Korean invasion, for the most part weren't enough.

You see proof of that in the military's latest decision to ask for more fighting funds—around $3-billion late this fall or in January.

This money will be needed to equip the four National Guard divisions as well as much expanded U.S. Marine Corps.

• • •

Even that won't be the last however. Defense expenditures are outstripping appropriations. Army Ordnance has already committed its entire regular fiscal 1951 budget request.

It means Congress will get more requests for supplemental appropriations, off-and-on, right up until it's time to consider regular fiscal 1952 money.

For the first time since Mr. Forrestal was secretary of defense, civilian military leaders are paying close attention to what the admirals and generals say they need.

• • •

The year-to-year cost of maintaining the West in a state of preparedness will total close to $30-billion, almost twice the $17.5-billion Forrestal budget.

Pay, food, allowances, and operations for a 2.5-million-man U.S. force alone will come to between $12-and-$15-billion.

Add another $10-billion-a-year for hard goods procurement to keep us in top fighting trim, and to replace losses in Korea and elsewhere.

This along with the roughly $4-billion that will be needed to help our allies round it out.

• • •

For the most part deliveries from contracts let with any additional funds granted by Congress will be added on to the end of present procurement programs.

Thus, it won't mean wholesale reactivation of reserve production facilities.

It does mean the strain on civilian production will be extended over a longer period of time, instead of added now.

• • •

Some industries aren't anxious for large defense orders. Manufacturers of competitive brand name products, like television sets, cars, household appliances, and the like don't want to cut back on civilian production while their competitors continue to flood the market.

It's a real problem for those companies that depend on public support of brand names.

The result is a tendency to bid high on defense contracts. This reluctance to do business with the government may mean enforced production allocations sooner than expected.

• • •

There's more to revived talk of the Navy's supercarrier than just one fighting ship. The admirals have been working over-time ever since Korea to work out a comprehensive program for making up deficiencies in their fighting force. Decision to build one or more large carriers is only part of over-all Navy plans.

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Korea has convinced General MacArthur a strong Marine Corps is essential. Defense Secretary Johnson will fall in line by the sheer weight of public opinion. The same thing holds for aircraft carriers.

• • •

Despite the impressive showing of Soviet heavy tanks in Korea, military strategists are still convinced new U.S. anti-tank weapons—when they finally get into mass production—will prove their undoing. The 3.5 in. bazooka is a case in point.

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Newspaper reports of 60-ton Stalin tanks on the Korean front are discounted at the Pentagon. Officials say they're just T-34's, lighter than the 45-ton U.S. Shermans, but equally gunned and just as maneuverable.

• • •

First allocation of industrial power may come in northern California. NSRB will rule soon on a plan to earmark 120,000 KW for new aluminum ingot production at the World War II-built Riverbank plant, at Modesto, Cal.

It would add 100-million pounds a year to tight U.S. supplies, and cut down the amount of power Pacific Gas and Electric now buys from the government's Central Valley Power project.

Chances are it won't mean any real pinch for industrial PG & E customers.

• • •

Plastics may replace the steel in G.I.'s helmets. Army is toying around with compressed nylon fiber; claim it's more bullet resistant than the ones it uses now. They may be tried out in Korea.

The mobilization tax bill—no matter what else it does—will raise $5-billion more a year for the Treasury. Personal income rates will be increased 9-to-17% beginning Oct. 1. Corporation rates will be upped from 38% to 45% effective July 1, 1950.

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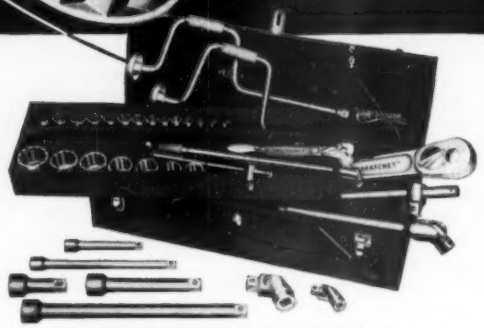

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Detroit

Tool shops are continuing busier. The story seems to be that producers in all industries are intent on getting their forward tooling requirements out of the way before any contingencies (meaning large arms production programs) take priority over their wants.

• • •

Automobile programs bulk important on the order books of the machinery makers. Even though car and truck demand has gone right through the roof since Korea, the companies aren't cutting back on their new model plans, as they ordinarily do when business is superlatively good.

Reasons: (1) The programs were well along anyway before Korea. (2) If crisis continues, the new tools are like money in the bank—usable anytime, probably more expensive later too. (3) If the crisis ends, the auto market may fall right on its face and need the stimulation of new models.

That last point isn't universally admitted. At least one company of stature is planning for 1951 (war excepted) on the basis of better business during the first quarter than in the first 1950 quarter. For those with short memories, the first 1950 quarter was gigantic.

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Production currently, meanwhile, is showing some effects of shortages. Steel is tighter and tighter; conversion steel is on order now all through 1950 and maybe, here and there, a little beyond.

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Nevertheless, it's not steel which has the auto men most worried today. It's copper and lead. Stockpiling of either of those two articles would put a crimp into car and truck production faster than steel, in spite of public hullaballoo over the latter metal.

• • •

Actually, war work won't require big steel tonnage for some time. Thus far the bulk of money allocation has been for planes. That means aluminum. Heavy steel use in World War II was for ships, tanks, guns. There are no ship programs at all now. Those for guns and tanks are light. Example: The Cadillac tank job likely won't get into production till next spring. Meaning: Between now and then there'll be plenty of steel for cars, trucks, other civilian goods.

That point is being pounded home in Washington by Detroit. No general publicity—simply education of official minds to the production facts of today's life. If steel goes on allocation now, Detroit maintains, there'll be large-scale automotive layoffs, nothing for idle worker to do on arms jobs, no help given the war effort either.

Pig iron is more in demand, too. The foundries are working longer hours. Some are doubling up shifts. Maybe that's a forerunner of war work—the foundries were worrisome production bottlenecks all through the war.

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First new cars for 1950-51 came from Kaiser-Frazer in the spring. Now Packard's about to pop with a new hot line. Formal announcement: Aug. 24. Next will come Hudson, whose plant shut down this month for changeover.

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Something else new: Buick's optional plate glass that reduces sun glare and heat entering a car. Glass of that sort has been under experimentation for years, finally has made the production grade. It's a possible forerunner of all glass tops—something that won't make the stamping die people happy.

And still something else: All-electric window lifts, standard equipment on Chrysler Imperial models. The electric unit is housed within the panel below the window; a button switch operates it. There's an individual control at each window, and a master control at the driver's place.

• • •

Pay is still going up. Labor negotiations are emphasizing the positive—raises now, not pensions later. In Michigan during June, last month of tabulation, workers earned an average $69.97 a week on a 42-hour week—an average $1.627 per straight hour.

• • •

Lincoln-Mercury got started on plans for a new assembly plant on 179 acres west of Wayne, Mich., in the environs of Detroit. The new plant will house Lincoln assembly work now done at the main Lincoln plant in Detroit and the Mercury assembly work done at River Rouge. Anticipated size: A million square feet.

In northern New Jersey, meanwhile, Studebaker put its proposed Atlantic coast plant planning into mothballs. Reason: The South Bend company decided that getting structural steel and other materials was too precarious. And, if not too precarious, too expensive for right now.

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The General Motors research laboratories are expanding their program in the metallurgical field. Indications are that special emphasis will be placed on heat-treat processes and methods.

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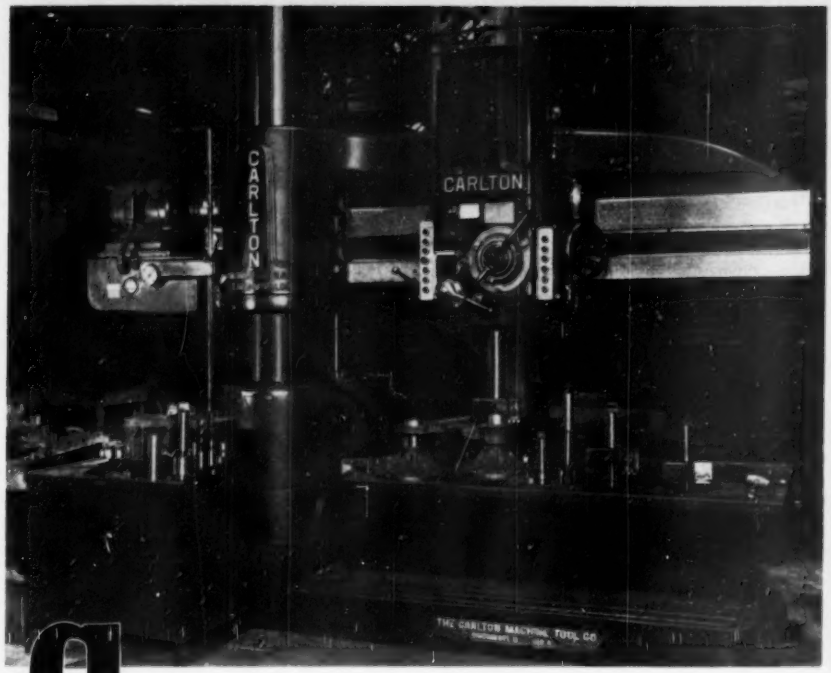
Ford is organizing for the war program, getting ready for whatever work may come its way. Its new Defense Production Division, created in early August, will coordinate defense and mobilization planning, and will do the negotiating on assignments from defense agencies.



Carlton's the favorite
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The George J. Meyer Mfg. Co., Cudahy, Wisc., selected a Carlton 4-A radial, added ingenious tooling of their own . . . and came up with an efficient combination for drilling, boring, turning and facing the housing of a bottle washing machine. The intricacy of a job like this calls for the rigidity of a Carlton. This and other "plus values" such as ease of operation and precision performance are Carlton standards.

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THE CARLTON MACHINE TOOL CO.

New Tooling

Machine tool orders in July were almost double the June dollar volume, preliminary estimates show. They were the biggest by far since war days. Only a small percentage came from abroad. Hardly a war order was included.

Backlogs for the industry, as a result, have jumped to nine months. Special machinery makers have much longer deliveries than that. One builder, for example, has "transfer" units scheduled for installation in December, 1951.

• • •

Warner & Swasey Co. expects to hire and train 1000 new workers, many of them women, as soon as possible. Other builders all over the country are adding men as they can get them, to their engineering staffs as well as to their shop forces.

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August sales of machine tools have been very high, though probably under the July level. It is significant that orders continue strong with companies which raised prices Aug. 1.

• • •

Some of increased machine tool prices are attributed to fourth-round labor boosts just granted, to higher costs of materials such as castings, and of parts like motors.

There is evidence that many buyers have purchased already all the machine tools they expected to buy in all of 1950. They did this to get on delivery schedules of builders and, in certain cases, to beat price raises.

• • •

It is possible that domestic orders may fall off later in the year, as an aftermath of anticipatory buying during the summer. Also the defense program may not yield orders in extraordinary volume this year.

• • •

ECA and AMP (Additional Military Production) still are scheduled to buy over $100 million of U.S. machine tools during fiscal '50. About $67 million of that total is from ECA funds. But chances are that much of the money will go for tooling for military production rather than for economic rehabilitation.

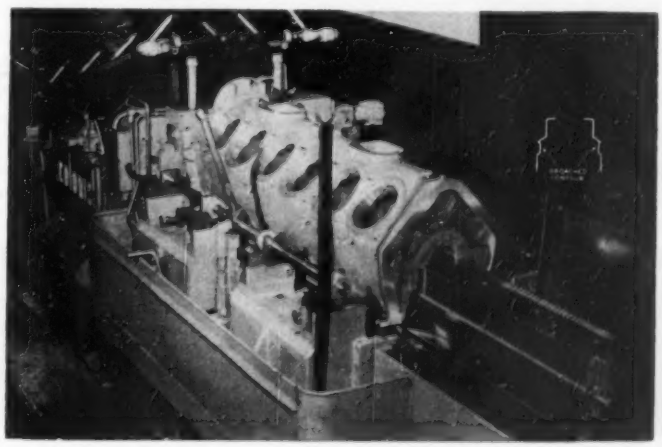
AMP orders for U.S. machine tools will involve tooling up for jet engine manufacture in France and other western European countries. Only $5 million of $15 million earmarked for machine tool purchases here was spent under AMP auspices in fiscal 1950.

State Department and ECA will fight hard to keep ECA and AMP near top in priorities. Though U.S. defense orders will take precedence over all other machine tool business, total volume should not be big enough for some time ahead to prevent western Europe from getting what it wants.

• • •

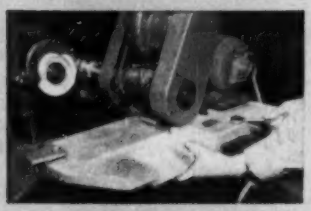
Expansion of aircraft program is not expected to take huge numbers of machine tools. In many cases, plans call for a stepped up number of engines now in production. That means that a healthy share of added output can be obtained from machines already installed and operating currently on slack schedules.

Inquiries have come in, however, for types of machines for aircraft machining which have not been built since World War II. Attempts have been made to secure suitable machines from government reserves, but without notable success.

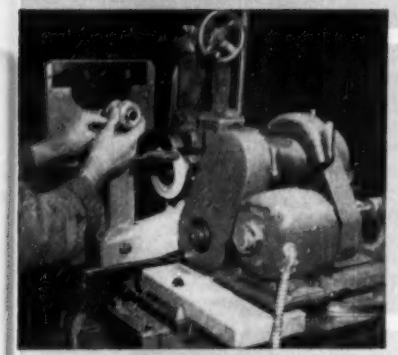


NEAT FINISH-BROACHING of bearing cap channels and inner faces of cross bolt bosses in aluminum alloy crankcase casting is acomplished with 15-ton, 90-in. stroke Colonial horizontal surface broaching machine. Six flat surfaces on each of seven transverse webs in casting are broached in a single pass. Tolerances are .002 in. for size and .0005 in. for squareness and parallelism. About .047 in. depth of stock is removed. Locating pins on the case flange fit into recesses in the platen. Single hand-operated lever actuates a series of 4 dogs on each side which grip the casting flange, holding it firmly against the platen surface. Cross-section of the case shows (with heavy line) the surfaces broached. Crankcase is from latest 12-cylinder air-cooled tank engine at Continental Motors.

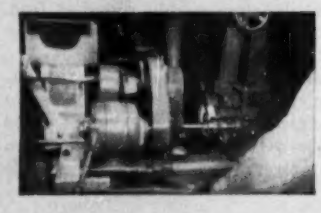
PRATT & WHITNEY Diaform CALLING ALL USERS OF UNIVERSAL AND TOOL GRINDING MACHINES



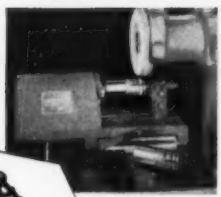
1. A time-saving "natural" is the Pratt & Whitney DIAFORM Wheel Forming Attachment. It gives you the ultimate in precision tooling with which to attain maximum speed, convenience and accuracy in the form-grinding of circular forming tools, crusher rolls, flat formers, split dies and similar work. Photo shows how an Adapter, especially designed by Pratt & Whitney for a Universal and Tool Grinding Machine, fits on the end of the swivel table. On it you set up the DIAFORM Attachment — *and leave it there!*



2. Here is DIAFORM in action. Operating on the pantograph principle, the operator simply traces the profile of an inexpensive template by hand. At a reduction ratio of 10 to 1, DIAFORM traverses the diamond over the wheel to form the contour *to tenths of a thousandth accuracy* on wheels up to 10" in diameter, on contours up to 1" in width x ½" in depth — in a matter of minutes.



3. The P&W Adapter does not interfere with normal grinding, nor is it necessary to remove DIAFORM from the Machine. It's right there, always ready for quick, accurate repeat truings. Close-up pictures the grinding wheel — its profile now DIAFORMED to precision limits — grinding a circular form tool held between centers. Templates for DIAFORMING are easily produced, easily mounted, easily stored.



The Pratt & Whitney DIAFORM is portable . . . works with equal speed and precision on any make Surface Grinder. For such machines, the DIAFORM and a Cylindrical Grinding and Indexing Attachment are ideal companion tools. Both form the perfect combination for grinding exact contours of screw machine circular form tools and similar work. Get full details on both from Pratt & Whitney.

Circulars tell the whole DIAFORM precision wheel-truing story. Write for your copies.

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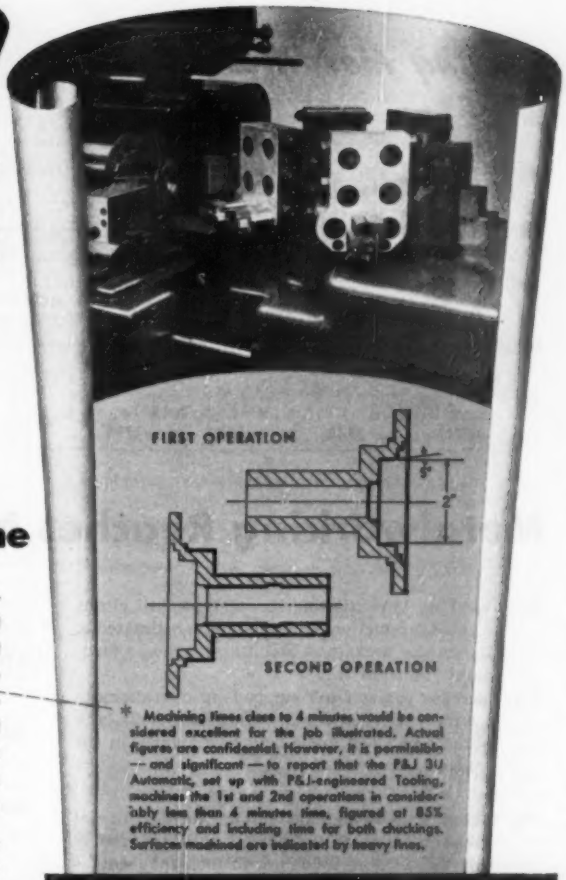
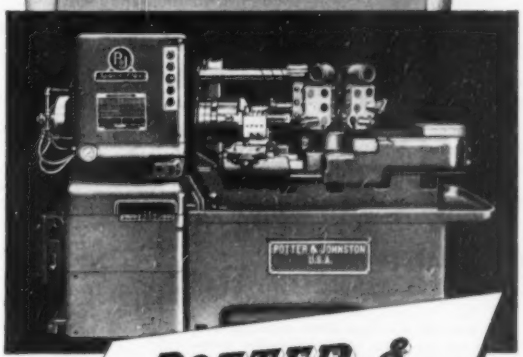
Automatic Turret Lathe



The *time* it takes to complete a series of multiple machining operations on a given part isn't the *only* factor that determines the profit potential of a machine tool.* Other factors, to mention a few, are unnecessary work handling, secondary operations, floor space, direct labor costs. It's when you add in *all* such factors that the P&J 3U Automatic looms as a leading contender for profitable productivity.

First of all, the machine *is* fast . . . with spindle speeds from 73 to 1445 rpm . . . and automatic changes in both speed and feed. Its flexibility permits the combining of cuts to avoid secondary operations and eliminate extra work handling. It requires no more than 16 sq. ft. of floor space. The fully automatic, precision performance of the P&J 3U — especially when it's teamed up with P&J Tooling skillfully engineered for the job — reduces rejects and cuts tooling and operating overhead. A single operator easily handles a battery of these speedy Automatics, thereby effectively dividing labor costs. May we estimate on *your* work? Simply send a sample part or prints—we'll do the rest.

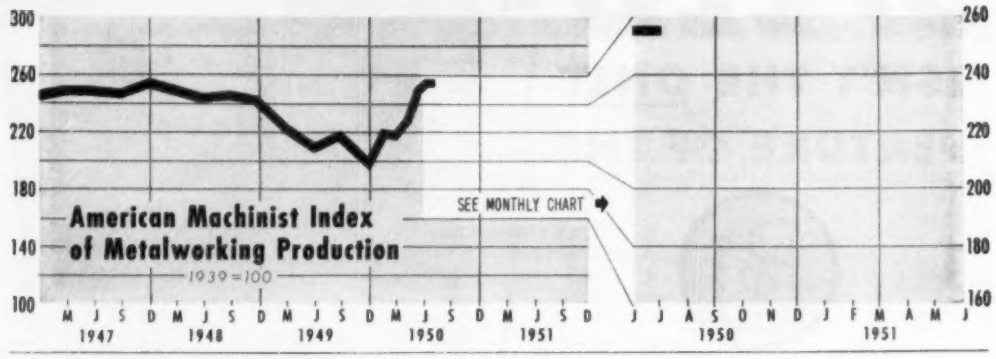
* Machining times close to 4 minutes would be considered excellent for the job illustrated. Actual figures are confidential. However, it is permissible — and significant — to report that the P&J 3U Automatic, set up with P&J-engineered Tooling, machines the 1st and 2nd operations in considerably less than 4 minutes time, figured at 85% efficiency and including time for both chuckings. Surfaces machined are indicated by heavy lines.



POTTER & JOHNSTON CO.
PAWTUCKET, R. I.
subsidiary of PRATT & WHITNEY
Division Niles-Bement-Pond Company

P&J 50 YEARS' EXPERIENCE IN TOOLING FOR
Precision + Productivity + Economy

Gaging Metalworking



Metalworking Reaches New High For Year

Metalworking is continuing its steady uphill climb. August production, in manhours, is estimated at 259 on the AMERICAN MACHINIST index, a four-point rise from July.

This increase comes from stepped-up operations in a wide variety of metalworking products both durable and consumer, and particularly in the railroad car industry.

• • •

The feeling is growing that defense needs will not take much steel until well into the fourth quarter. Sizable tonnages, in fact, may not be diverted to defense plants until early in 1951.

As the present armament program gets rolling, it probably will absorb about 6 million tons of steel a year, compared with 1 million tons recently for military items. Total finished steel capacity is around 67 million tons annually.

Certain steel products—plates, strip, bars—will feel the impact more than others. And users of such types of steel will begin to be squeezed.

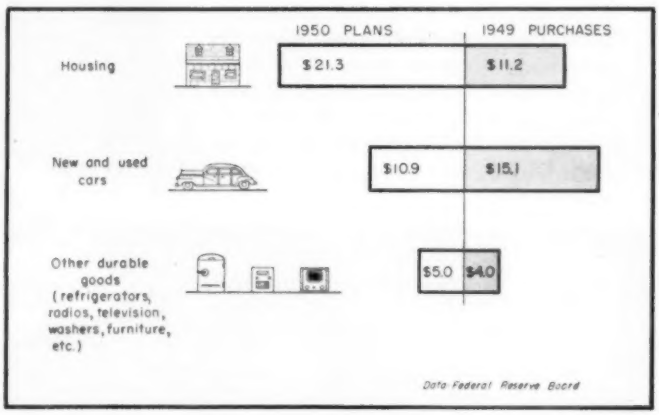
Military "hardware" requires a lot of alloy steels too. These steels have not fared so well in the postwar period.

Steel industry's ingot capacity has just passed the 100-million-tons-a-year mark. Latest figure reveals current production at 99.9%.

A voluntary steel-rationing system is being urged by steel producers. The post-war voluntary plan is cited as evidence that the industry can do the job without compulsory allocations.

CONSUMERS HAVE BIG BUYING PLANS FOR 1950

Purchases of homes, autos and appliances planned for 1950 will considerably exceed 1949 buying, provided everything desired is obtainable. However, scarcities are already developing as a result of the Korean situation and general defense mobilization. Builders are having to pay more for materials, and the curb on housing credit will influence the housing picture still more. This in turn will affect appliances. Automobiles, both used and new, may be more difficult to buy before the year is out.



INDEX

	JULY '50	JUNE '50(p)	MAY '50(r)	JUNE '49
	255*	255	248	216
Machinery		233	230	203
Electrical Manufacturing		296	292	229
Automobiles, Trucks		250	241	198
Transportation Equipment		228	221	242
Other Metalworking		273	261	231

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

*Estimated (p) Preliminary (r) Revised

No appreciable amount of armament business has come to contract tool and die shops. Yet tool and die business is running comfortably ahead of last year. Shipments in June were 39% better than in same month last year. Backlogs are above those of a year ago. More shops are working overtime, mostly because of trouble in getting skilled men.

Increasing number of contract shops regard the outlook as excellent. Michigan, with its automotive customers, is most active area in the nation. Shops there have been drawing skilled men from other districts. Shops in Connecticut, New Jersey and Philadelphia districts are doing better than average.

• • •

The screw machine products industry ended June with new orders zooming to heights not recorded since the fall of 1946. Business the past 30 days has been excellent. Shipments recently have reached a new high for the year.

Railroads plan to purchase 122,000 new freight cars. Freight car production will be stepped up to 10,000 cars a month by early 1950. Output in June was 3874 cars.

Pennsylvania Railroad will buy 5000 new freight cars. Cost of these cars, plus 16,989 new freight cars already ordered and 17,000 cars to be reconditioned in Pennsylvania's own shops, will total $137 million.

Thirty-eight diesel electric locomotives have been leased by Baltimore & Ohio under Equitable Life's plan. Six units have already been delivered by Baldwin Locomotive Works, remainder are scheduled for November delivery.

• • •

Operating rate of gray iron foundries has increased to 87% as result of attempt of users to rebuild inventories and of expanded buying for current needs.

Production of steel castings has gained, with output at 80%, as against 60% a year ago. Backlog of unfilled orders is enough for 45 days and is increasing. Railroad car building program will step up schedules as soon as orders actually are placed.

• • •

Cutting tool manufacturers have the largest volume of business today since 1948. Much of buying comes from customers intent on stockpiling, fearing what may happen to their regular supply under any form of allocation.

Some cutting tool people have felt stimulus of increased aircraft business. They have almost been cleaned out of certain types of tools, and now have the double job of supplying current demand and of building their own inventories. Many cutting tool makers are running overtime in their shops.

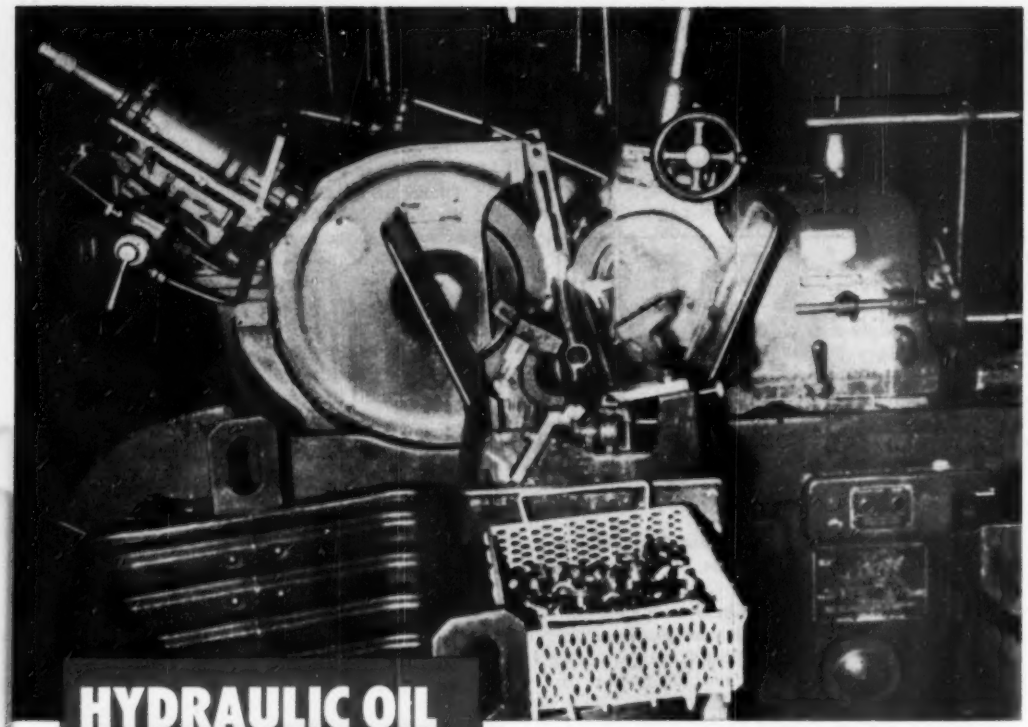
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week index of activity (1923-1925 = 100)	219.4	220.4	181.0
Steel ingot operations (% of capacity)*	99.9*	100.7	82.3
Electric power output (million kilowatt-hours)	6247	6190	5466
Production of automobiles and trucks	173,930	194,828	142,718
Engineering construction awards (Eng. News-Record; millions)	$164.0	$209.3	$257.3

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators, domestic sales (thousands of units)	534	529	296
Vacuum cleaners, sales (thousands of units)	250	279	207
Washers, sales (thousands of units)	325	305	261
Household electric ranges, sales (thousands of units)	159	145	68
Television receivers, production (thousands of units)	389	376	161
Radio receivers, A.M. and A.M.-F.M., production (thousands of units)	1054	900	512
Gear sales index (1935-1939 = 100)	401.0	363.1	227.8
Foundry equipment new orders index (shipments 1937-39 = 100)	622.7	294.9	164.9

* Based on July 1, capacity.



HYDRAULIC OIL CONSUMPTION REDUCED 74%*

by changing to Texaco Regal Oils (R&O)

A large midwestern plant is making this saving on some eighty hydraulically operated grinders, many of them used for grinding ball bearing races. With the exception of small amounts of make-up, some of the machines have run over a year on their original fills of *Texaco Regal Oils (R & O)*.

This 74% saving in hydraulic oil consumption is only one of the advantages this plant gains by its change to *Texaco Regal Oils (R & O)*. Others are smoother hydraulic operation, longer pump life, less machine downtime, lower maintenance costs.

Texaco Regal Oils (R & O) are highly refined turbine-grade oils inhibited against rust and oxidation and processed to prevent foaming. They are approved by leading hydraulic manufacturers, many of whom ship their units already charged with these outstanding oils.

A Texaco Lubrication Engineer will gladly give you the name of the plant where these savings are being made, and help you make important savings in *your* plant. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

*Name of this Texaco user on request

TEXACO

TEXACO Regal Oils (R&O)

FOR ALL HYDRAULIC UNITS

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Time To Mobilize The Three M's

We are heading into a partial war economy. Problems of materials, machines and manpower confront us again, as in the last war.

Alert management should take a look at all three problems right away. Inevitably, comparison with 1939 comes to mind.

THE SITUATION TODAY IS QUITE different from then. Metalworking now is running at two-and-a-half times the 1939 rate. Surpluses don't exist in metals. Shortages trouble us instead. And things promise to get worse rather than better.

Machines are not yet a serious problem. Some unused capacity still is reported. But delivery dates are rapidly being shoved farther into the future. Priorities loom later.

We do not have much leeway in manpower. More people are employed than ever before, the period of the last war excepted. Yet we know that jobs will open up before long for thousands of workers.

The squeeze thus is starting in the three M's. It will get tighter and will hurt more as the months go by.

INTELLIGENT MANAGEMENT HAS open to it only one course. It must make better use than ever before of materials, machines and manpower. That is our main hope of continuing to have butter while we produce guns. It is our best hope that the armed services will get the weapons they want as quickly as possible.

Management, for one thing, should examine the design of its products. Can it switch from a more critical to a less critical material? Can it come up with a new technique of manufacture which takes a smaller amount of material? Can it make its products more easily if they are redesigned?

Management also should examine its mechanical equipment. Is it resorting to human muscles —and that means waste of manpower—to do what mechanical horsepower can do better and faster?

GOOD MANAGEMENT SHOULD DO both of these things: replace obsolete machines with new and more productive ones; and get out of machines now in its shop all that it possibly can.

It should make use of carbide tooling. It should not be afraid to employ higher machining speeds now available.

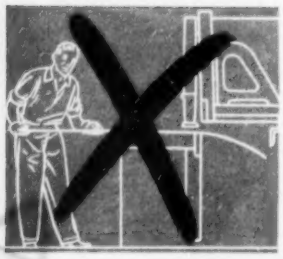
It should train its foremen in better ways of doing things and in handling men better. It should make plans to train new workers well as they come into the labor force.

If these essentials are done, the three M's will cause management a minimum of headaches. What is more, management will discover that it can keep its costs down and can meet customers' delivery dates with the least strain and the greatest success.

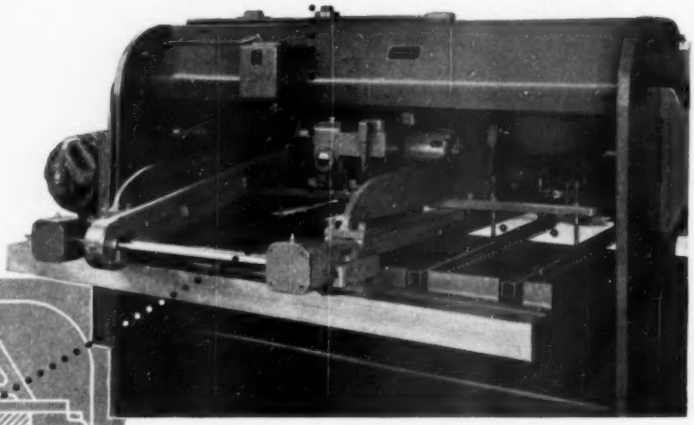
Burnham Finney

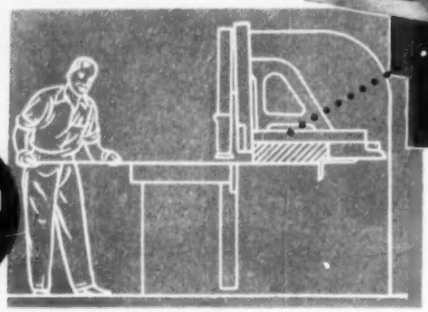
Another Cincinnati Feature

. . . the No-Sag Magnetic Sheet Support



Troublesome Sag





Quick gauging—easy handling

WRITE for detailed information

Thin steel sheets that sag, and normally are difficult to back gauge, are handled easily and accurately with the Cincinnati Magnetic Sheet Support. Costs are reduced, production increased, and quality of product improved. Maximum capacity: 16 gauge. Range: 36″ to 48″; for magnetic sheets only. Available as extra equipment on new Cincinnati Shears.

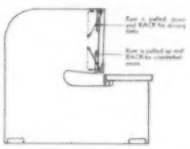
Other features pioneered by Cincinnati FOR SPEEDY AND ACCURATE, PROFITABLE SHEARING

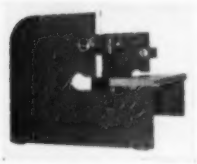
HYDRAULIC HOLDDOWNS

Tons of pressure hold the work securely—a necessity for accurate cutting.

NON-FLOAT INCLINED RAM

Produces the most accurate shearing in the field and gives six major advantages — including shearing different thicknesses without changing knife clearance.



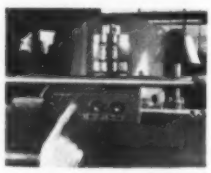


ALL-STEEL, NON-BREAKABLE FRAME

Developed and pioneered by The Cincinnati Shaper Company for long life and accurate performance.

PRECISION BACK GAUGE

Accurate to .002″—easy to use. Power front or standard hand control.

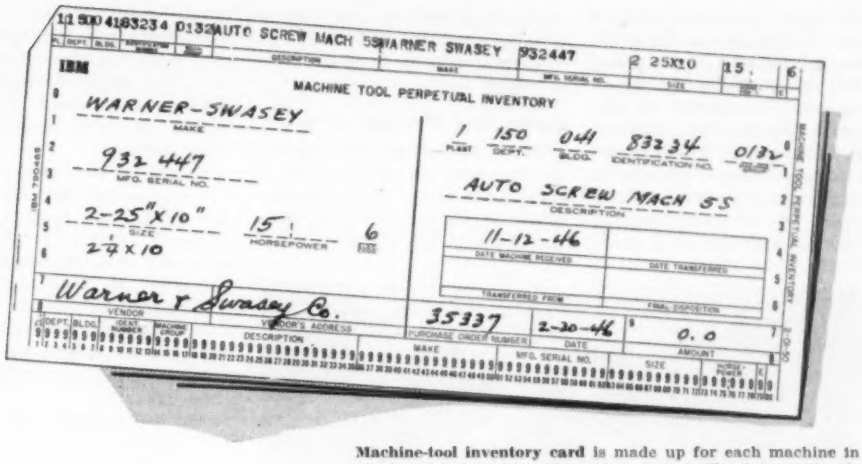


THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

CINCINNATI



Machine-tool inventory card is made up for each machine in plant and is held in equipment engineer's file. Information is readily available on any machines by department, type of equipment, or several other classifications

Organized Replacement Steadily Increases Plant Productivity

36% less machining time per piece, yet higher quality production, results from a new equipment program that keeps IBM manufacturing executives abreast of replacement possibilities within the company

By MILES J. ROWAN, ASSOCIATE EDITOR

During the past ten years, a 36% reduction in machining manhours per piece[1] has been achieved at the Endicott Plant of International Business Machines Corporation. Over the same period, the company has invested several millions of dollars in new machine tools. Not all of the decrease, of course, can be attributed to new equipment, but better machine tools lead to better methods, better tooling, and higher productivity on the part of employees. It is the combination of all of these factors that accounts for the large decrease in machining manhours and convinces management that 'there's no better paying investment than the right tools for the job."

Evidence that this philosophy is put into practice may be found in the company records for the past five years. With the exception of special-purpose equipment, practically 100% of the machine tools at the Endicott plant have been replaced since 1945. This has been done through the normal operation of a replacement program that has developed gradually over a number of years.

In its present form, IBM's program has seven salient features: (1) One man is in full charge of all equipment activities. (2) Manufacturing men get the latest information on machine-tool developments. (3) Equipment recommendations are based on group thinking. (4) Management is informed of replacement opportunities. (5) Dollar savings are not the only criterion for equipment purchases. (6) Expense records are kept on every machine tool in the plant. (7) The equipment engineer reports directly to 'he plant superintendent.

The man who heads up this program in each of the company's plants is the equipment engineer. It is his duty to direct and coordinate all activities per-

[1] The percentage reduction was determined by cross-section job sampling.

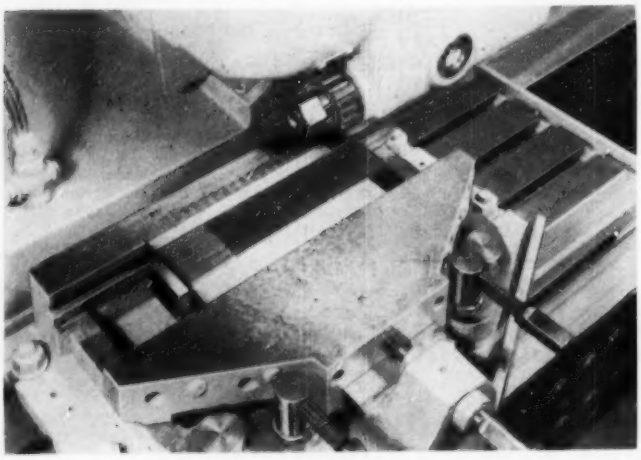
taining to the purchase or sale of machine tool equipment. He is the equipment specialist of the plant, and full responsibility for determining what equipment to buy rests with him. In this regard, it is important to note that the equipment engineer reports directly to the plant superintendent and thus is a part of the manufacturing organization. Purchasing, in effect, performs a service function by entering purchase orders in line with requests from Equipment Engineering.

Knows New Developments

One of the most important duties of the equipment engineer is to keep up with the latest developments in the machine tool field, and to make sure that their possibilities in IBM are fully explored. Whenever a new idea turns up, he sees to it that production executives, tool engineers, methods engineers, department managers[2], and all interested plant personnel are informed.

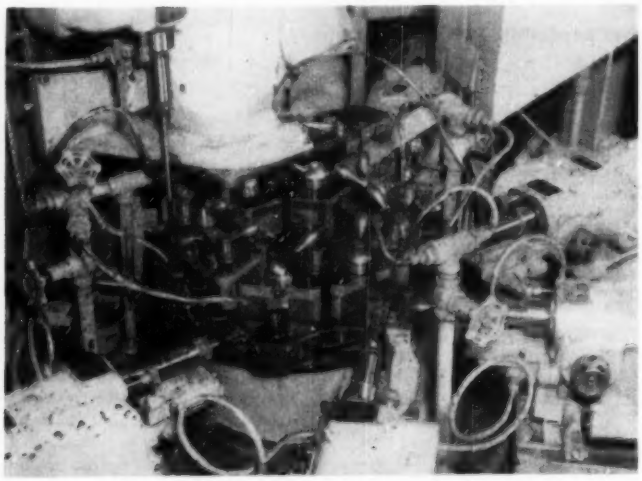
Should the idea seem attractive, the equipment engineer obtains full information from the manufacturer, involving discussions with the area representative, if necessary. He then obtains IBM cost figures for the jobs in question and holds a meeting of all those plant men who are responsible for tooling and production on those operations that will be affected. In this way, the thoughts and requirements of all people who are involved in the project are made known and the possibilities of overlooking considerations that have an important bearing on the proposal are greatly reduced. In many cases, a decision as to whether to go ahead with the project can be reached quickly; in others, questions are raised that require additional checking — or perhaps, even arranging to send work for test runs in the manufacturer's plant. But when the decision is made, IBM knows that all reasonable steps have been taken to make sure that anticipated benefits from the machines will be realized.

The next step is to present the proposal to top plant management. Final cost figures are prepared and entered in an appropriation form along with any other factors pertinent to the project. Upon approval, the equipment engineer then proceeds with the purchase.



OUTPUT UP 10 TIMES

Special milling machines cut racks on jobs where quantity does not justify gang milling. On the average job, net production per hour is ten times that obtained from machines that were replaced



PAYS OUT IN TWO MONTHS

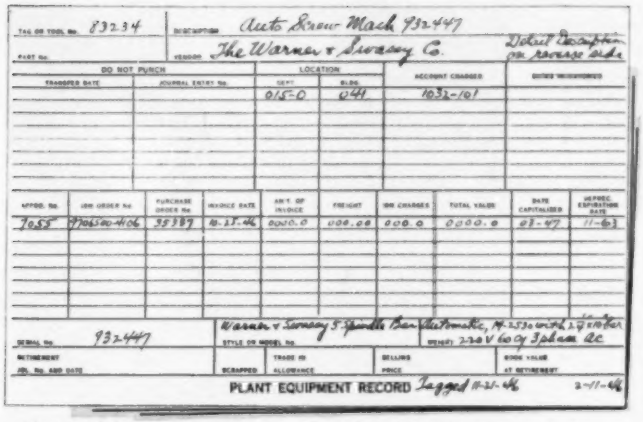
New multi-head machine drills, burrs, and taps setscrew holes in steel collars and reams burrs from center hole. Machine replaced sensitive drilling with hand jigs. Machining and loading and unloading are much faster

There Is No Fixed Formula

It should be emphasized that dollar savings alone are not the only criterion for judging a proposal to purchase new equipment. Likewise, there is no set "payout period" in which a machine tool must pay for itself out of savings. Each proposal must be judged individually, and no fixed formula has been found that will satisfy the varied requirements of IBM's equipment needs.

In many cases, of course, savings

[2] At IBM, the department manager is first-line management—the man who is directly responsible for supervision over operations in his area.



TAG OR TOOL No. 83234 DESCRIPTION Auto Screw Mach 932447
PART No. VENDOR The Warner & Swasey Co. Detail Description on reverse side

DO NOT PUNCH

TRANSFER DATE	JOURNAL ENTRY No.	LOCATION DEPT	LOCATION BLDG.	ACCOUNT CHARGED	ENTRY WITHDRAWN
		015-0	041	1032-101	

APPROP. No.	JOB ORDER No.	PURCHASE ORDER No.	INVOICE DATE	AMT. OF INVOICE	FREIGHT	INS. CHARGES	TOTAL VALUE	DATE CAPITALIZED	APPROX. EXPIRATION DATE
7055	7055041106	35389	11-17-46	0000.0	000.00	000.0	0000.0	01-47	11-63

SERIAL No. 932447 STYLE OR MODEL No. Warner & Swasey 5 Spindle Bar Multomatic, M-2532 with 27 Hp Motor DRIVE 220V 60~ 3phase AC

RETIREMENT (SO. No. AND DATE) SCRAPPED TRADE-IN ALLOWANCE SELLING PRICE BOOK VALUE AT RETIREMENT

PLANT EQUIPMENT RECORD Tagged 11-21-46 3-11-46

Plant equipment record contains all pertinent information on each machine. Charges are accumulated on tabulating cards, then posted to this form, which is master record held in Accounting. On reverse side is detailed description of machine, specifying all major components

are the reason for replacement. Investigation of a new piece of equipment convinces management that in comparison to the condition and performance of an existing machine tool, IBM cannot afford to continue operating with the older machine. However, quality, safety, and maintenance all are sound reasons for replacement, and the company has purchased new equipment for one of these reasons, even though no direct-labor savings were realized.

Quality Standards Are High

In producing the accounting, statistical, recording and signaling, typewriting, and time indicating equipment that makes up the IBM line, close tolerances and good surface finish are required on many of the components. Quality standards are high, and machine tools must be capable of meeting these standards consistently. If Quality Control points out that any production unit is a poor performer, the result may be replacement of the unit, assuming uncontrolled factors are not present.

The same is true as regards safety and maintenance. Safety is stressed continually at IBM and any machine or device that reduces the possibility of accident is given careful consideration. In fact, IBM production executives drew upon their experience along these lines to suggest nine features that deserve the attention of equipment manufacturers in designing machine tools for greater safety, when asked to participate in the 1949 Sales Conference held at Cornell University by the National Machine Tool Builders Association and the American Machine Tool Distributors Association.

Watches Expenses

To keep track of maintenance expense, IBM has a tabulating card file in which every machine in the plant is listed, together with auxiliary equipment or attachments that go to make up the complete production unit. Expenses assignable to each machine are entered by accounting, and a complete report of the maintenance cost on each machine is forwarded to the equipment engineer once each year. Excessive costs are questioned and may result in replacement of the machine.

Of course, despite staff functions that point out the need for new equipment in terms of savings possible, maintenance expense, safety features, or quality performance, the individual department manager still remains as one of the most important figures in the entire replacement program. Many suggestions relating to any one of the four major reasons for buying a new machine come directly from operating supervision.

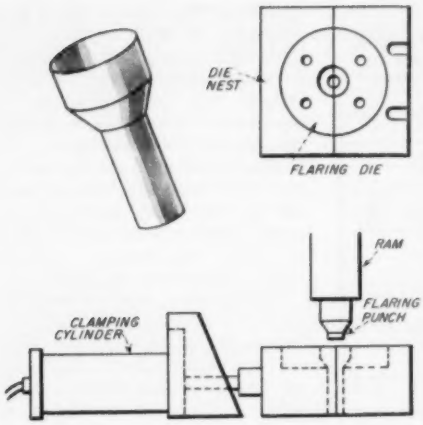
Recognizing this, IBM sees to it that direct-line supervision is well informed. In addition to advices from the equipment engineer, visits to manufacturers' plants are arranged for demonstrations of equipment. Attendance at Society Meetings and Exhibits also is encouraged. For example, for the recent Tool Show, the company sent 45 men from the Endicott plant alone. These represented all levels of plant management including many department managers.

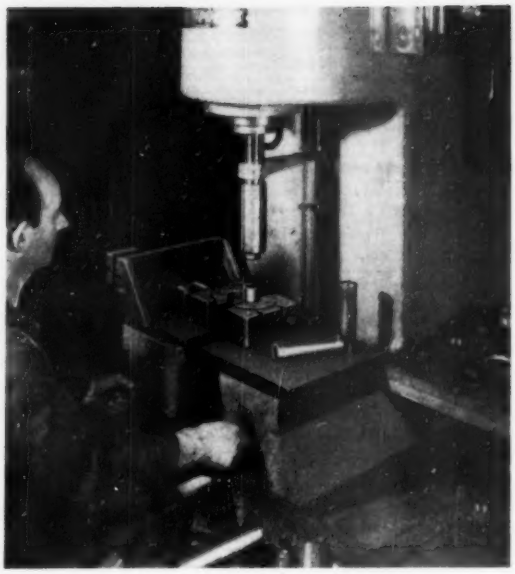
IBM believes that its manufacturing men must know the capabilities of the machines and methods that perform the operations for which each is responsible, and that whenever new technology is developed they must understand its implications and realize its possibilities in their own producton. If changes in practice are required, they must know how to make correct applications and to take full advantage of the benefits of the new process. This requires an investment in education, but the company feels that the time and money spent on activities along these lines are well worth the cost.

Budgetary Control

In recent years, replacement and new equipment purchases have been made on a budget basis. Each year the Equipment Engineer confers with top plant management in the preparation of a new equipment budget broken down by departments. Past performance and anticipated product changes or additions to the line are a guide in establishing requirements for the coming year.

In looking to the future, IBM expects to continue replacing machine tools whenever it is economical or desirable to do so. Past experience has convinced management that it is one sound way to offset the many pressures toward higher costs. Supporting this belief is the fact that the company has not increased the stated rental on any of the business machines that it has in service throughout the country. One of the principal reasons that this has been possible is the 36% reduction in machining manhours that has been effected during the past ten years as a result of better equipment, tooling, and methods.

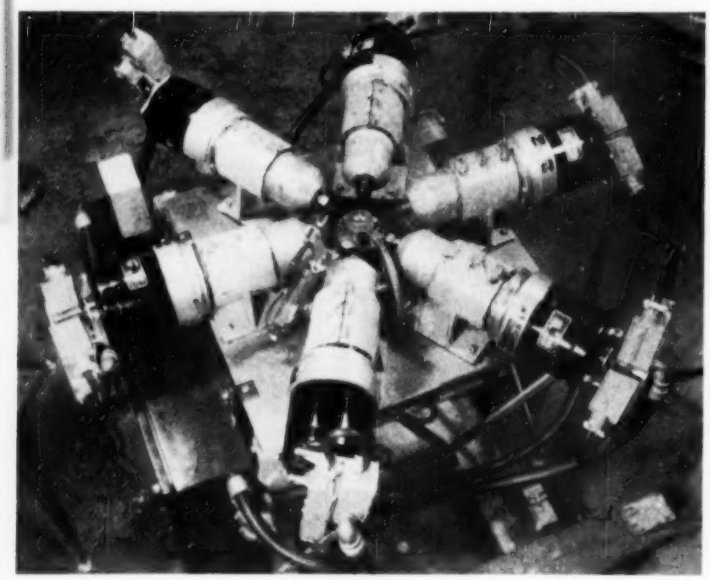




SEQUENCE VALVE CONTROLS FLARING

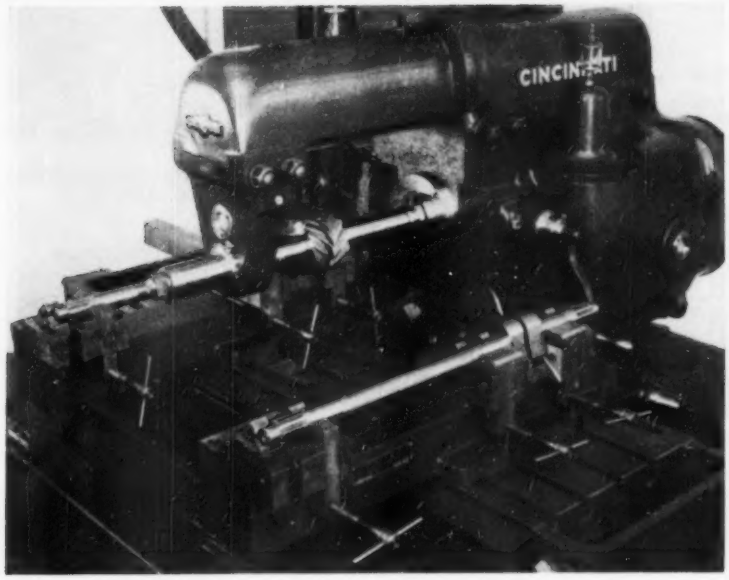
Tubes with 0.035-in. walls are loaded in die, then hydraulic system works through external cylinder to close jaws before ram descends. After making flare, ram returns and operator steps on pedal to release die-closing cylinder pressure. Cycle holds tubing until after tool on ram strips work. Short-run design allows die change in 5 min. *Denison Engineering Co. (Installation: Federal Auto Products Co.)*

TALENTED TOOLING



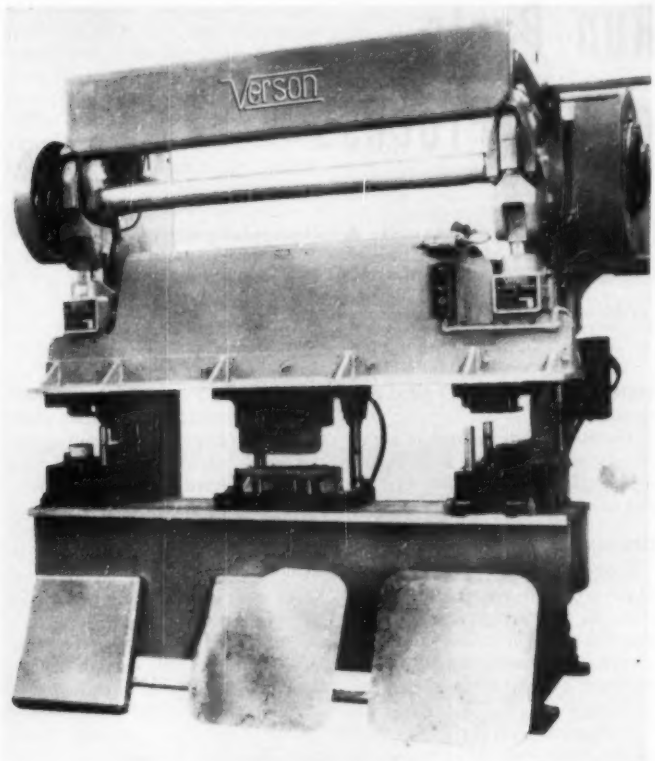
DRILL CYCLE SYNCHRONIZES SEVEN HEADS

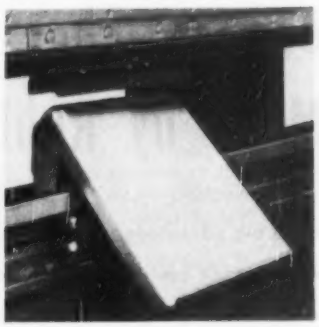
Seven lacing holes in aircraft bolts are drilled simultaneously by seven drill units. Loading is manual, work-clamping is pneumatic, and drill motion is electrically interlocked. Hydraulics come into the picture as coolant and as integral oil baths in which the drill spindles work



HYDRAULIC TRACER MILLS BRAKE CAMS

Steel cams for automobile brake releases are milled by high-helix cutters at 210 sfpm on dual setup. Quick-acting vises clamp two parts alternately as machine goes through automatic cycle, guided by profile templet at rear of table. Table moves right for both cuts, then reverses, returns, and starts over. Fixtures are reversible for left- and right-hand parts. *Cincinnati Milling Machine Co.*

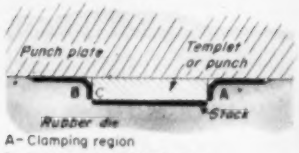




STANDARD BRAKES FORM BALL CORNERS

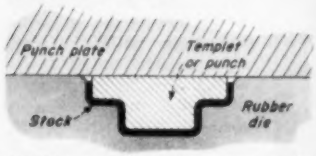
Rounded ends in sheet-stock pans are formed in a standard intermediate press brake by three sets of dies. Right to left: Round corners are trimmed, corners are drawn one at a time, and surplus material is trimmed away. Restrike die (above) forms side flanges in ball corners. Dies consist of master ends and changeable filler blocks between. *Verson Allsteel Press Co.*

BLANKING...

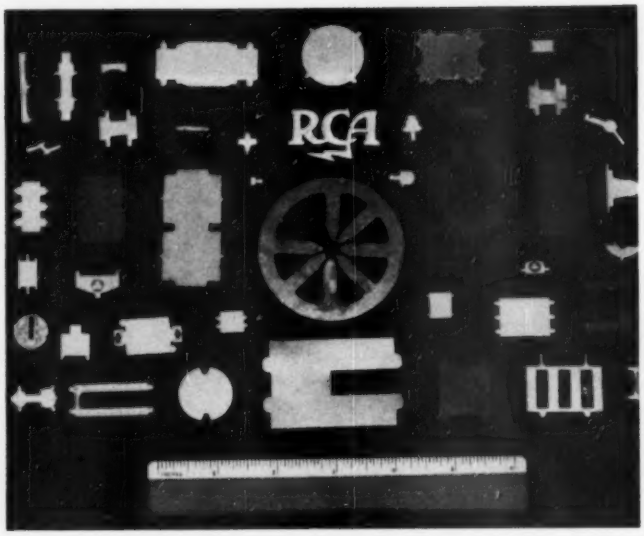


A– Clamping region
B– Pressure on bridged area
C– Edge of punch

DRAWING...



Blanking requires the stock to be clamped between the rubber mat and the punch plate, so that localized stress at the sharp edge of the templet or punch ruptures the material. In drawing, fluid-pressure action of the rubber forces the material to conform to the contour of the templet or punch



Parts as small as ⅛ in. or less in major dimension are made for electronic-tube parts by the rubber-die technique

SMALL Short-Run Parts Made by Rubber-Die Process

BY WILLIAM J. BACHMAN
Tube Department
RADIO CORPORATION OF AMERICA

It's a big advantage in a competitive market to be able to make developmental parts quickly and at small cost for tooling. Now small blanks and formed articles in thin, hard materials can be delivered the same day as ordered or soon thereafter

ELECTRON-TUBE parts are a far cry from aluminum aircraft stampings produced by the rubber-die technique. But we find that the same process saves much time and money in providing developmental parts from the harder materials like Kovar, molybdenum, stainless steel, and even non-metallic materials.

In this work, we discovered that an optimum thickness exists for the templet or punch used in blanking. And we also learned the hard way about the necessary characteristics of the rubber pad used in the process and pressure requirements for thin and hard materials.

The rubber-die techinque is relatively simple, but a brief review is essential to understand why we can employ it in our work.

Description of Process

In blanking, the rubber-die technique is based upon the rupture of material in tension along a preselected line. The sheet is laid upon a rubber pad which is backed up by steel on all sides except the working face.

A templet, several times as thick as the stock, serves as the punch and is placed on the metal. Pressure is applied to a flat punch plate and the rubber pad is compressed. Material outside the templet outline is clamped to the punch plate. Pressure is built up until stress in the unsupported area around the templet exceeds the tensile strength of the sheet metal. Rupture then occurs along the sharp edge of the templet.

In forming or drawing, the sheet does not extend far enough beyond the templet to be clamped. Hence, the metal does not rupture but forms around the templet. Holes and embossings added to the tem-

plet are included in the finished product. For embossings, the templet should be made so that the raised sections are formed before the clamping action takes place.

Rubber Considerations

As may be expected, hard rubber (90 durometer) gives excellent results in blanking, but its life is extremely limited. As the hardness is decreased, life is increased. At a rubber hardness of about 65-70 durometer more than 3000 parts and often as many as 5000 can be obtained without replacement of the rubber.

When a durometer of about 30 is reached, any small space between the die cavity and the punch pressure plate serves as means for escape. Application of pressure results in "creping" of the rubber at this point. High pressures cannot be obtained; the rubber is damaged.

Templet Requirements

In the development and use of the rubber-die technique for small parts at RCA, the key to success was found to be the ratio of templet thickness to material thickness.

An optimum templet thickness exists for each job. If this thickness is exceeded, a rough jagged blank results. A decrease in templet thickness from optimum requires a corresponding increase in pressure. Finally, a point is reached at which it is impossible to cut the material. The optimum value is one which will produce a clean blank with minimum pressure.

An accompanying chart gives optimum relations between templet thickness and material thickness for blanking stock 0.0005 to 0.010 in. thick. As shown, the ratio of templet thickness to material thickness for several specific material thicknesses follows: 0.0005 in.—19 to 1; 0.003 in.—14 to 1; 0.005 in.—12 to 1; 0.008 to 0.010 in.—10 to 1. Although shifting of the curve will be encountered when materials of different temper are employed, this chart will provide suitable initial trial values.

As several templets can be machined simultaneously, it is good practice to make several of different thicknesses. If the templet of the calculated thickness is not satisfactory, it is but little work to blank parts with templets of successively reduced thickness until good blanks are obtained. Initial pressure should be approximately 4000 psi.

After optimum templet thickness is determined, pressure should be reduced to the minimum value required to produce accurate parts.

As mentioned, the ratio of templet thickness to material thickness affects the pressure required to produce parts. Equally important is the area of the die used. Total pressure required will vary directly with the area of the die. This consideration is important in the selection of a press to produce any individual job or range of jobs.

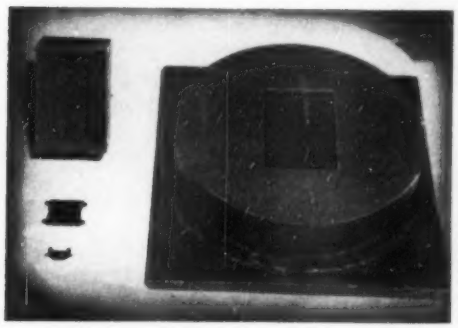
Advantages and Limitations

There are certain limitations to the contours that can be used successfully. Deep narrow slots, for example, will shear along the sides but fail to cut clean at the base. Frequently, however, the joint is so heavily strained that a small amount of bending of the part after it is removed from the die will cause it to break cleanly. Similar conditions occur on small pierced openings.

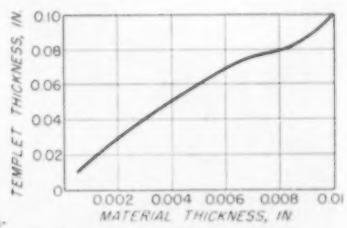
For most parts, however, the use of the rubber-die technique offers many advantages. Shallow draws, pierced parts and blanks can all be made in one operation. Tooling costs, after the initial investment in the die itself, are small. The average cost for templets is about 1/10 to 1/15 that of the conventional hand-fed blanking die.

Though operator time required to make parts is relatively long, as many as 2500 parts or more can be made before it becomes economically advantageous to employ conventional punch-and-die methods. If the press has sufficient capacity and templets are used to produce several parts simultaneously, this number can be greatly increased. Moreover, since pierced holes and embossings can be added to the operation at very little extra cost, the quantity of parts that can be made economically is further increased. In development of electron tubes, production tools are usually ordered before rubber-die tooling becomes uneconomical to use for any of our parts.

Templet storage for small parts is no problem. Development of an electron tube extends over many months. Small quantities of parts are required at frequent intervals. By using the rubber-die technique, templets, equivalent to a cabinet full of conventional dies, can be stored in individual envelopes in a space less than that required for a shoe box.



A rubber pad is confined by a die holder. The rubber must not be soft enough to squeeze out between die holder and punch plate



Optimum templet thickness bears a relationship to stock thickness. Make templets of several thicknesses and work progressively to the thinner ones to obtain smooth blank edges

SELECTION OF PRODUCTION MILLING PROCESSES . . IV

To reduce cycle time per piece for production parts, reciprocal, box and progressive milling operations may be used, singly or in various combinations

BY MARIO MARTELLOTTI, THE CINCINNATI MILLING MACHINE CO.

IN RECIPROCAL MILLING, both the right- and left-hand ends of the table are provided with fixtures. While milling the part in one fixture, the operator unloads and reloads the other fixture. Thus, loading and unloading time is not charged to the operation, because the machine is doing productive work at the same time.

The complete cycle is obtained by duplicating, on each side of the table, the cycle which would be obtained in single-piece milling. Half of the cycle is shown sequentially in Fig. 1; the other half takes place at the left hand of the table.

The time to be considered in reciprocal milling includes milling time, idle cycle time, and handling time. In this case T_6 is the handling time required to start the cycle of operation. (See page 91, July 10, 1950).

Because of the symmetrical location of the fixtures, the time per piece is obtained by determining the milling time, idle cycle time and handling time for only half of the cycle. Milling time for one piece is:

$$t_m = \frac{A + O_1 + O_2 + L_s}{F}$$

and the cycle time is:

$$t_i = \frac{A + O_1 + O_2 + 2L_s + L_s}{R}$$

The cycle time per piece is:

$$t_c = t_m + t_i + T_6$$

Abstracted from "A Treatise on Milling and Milling Machines," which will be published at an early date.

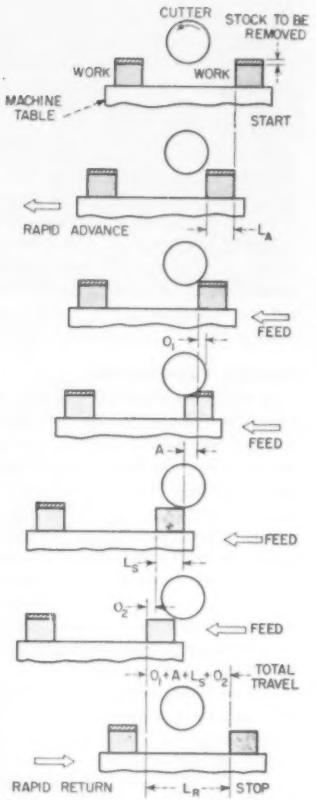


Fig. 1 . . Handling time is reduced by reciprocal milling. One-half the cycle is shown diagrammatically; the other half occurs at left end of table

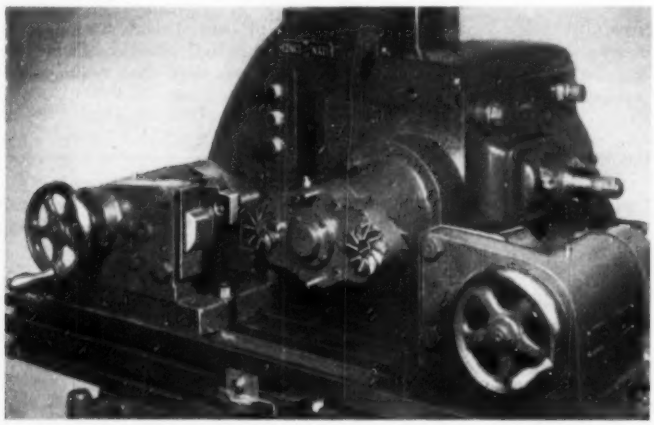
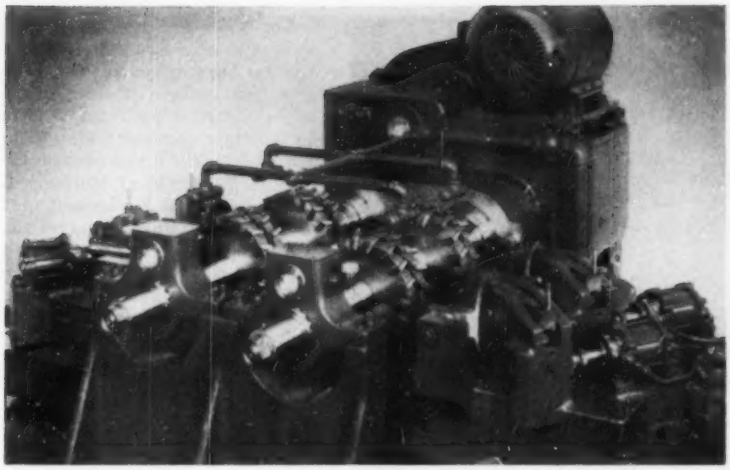


Fig. 2 . . A special milling attachment with two pairs of cutters is used on an automatic machine to mill the faces of a slot in a casting

where:

t_c = cycle time per piece, min.
t_m = milling time per piece, min.
t_i = idle machine time per piece, min.
T_6 = time to start cycle of operation, min.

The formula for t_c is the same as for single-piece milling with the exception of the handling time, which, in this case, includes only



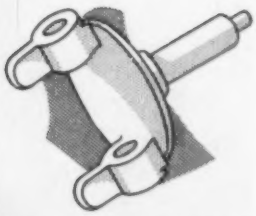


Fig. 3 . . Two fixtures at either end of the table provide for a combination of abreast and reciprocal milling, to increase production. Inside bosses of steering knuckles are being machined

that time needed to start the cycle of operation.

In applications of reciprocal milling, a left- and a right-hand fixture must be used. This adds to the cost of the equipment. However, only one cutter or set of cutters will be required for milling the piece or pieces in each fixture.

Milling a Slot By Reciprocal Milling

IN THIS application, Fig. 2, the fixture at the left of the table holds one piece in the same manner as the fixture at the right, but inverted or rotated 180°. A slot is milled by "plunge cut." The operator loads one fixture while milling the slot in the part clamped in the other fixture. The cycle is:

Load left-hand fixture, rapid advance table to right, feed table to mill piece in the fixture at the left while operator unloads and reloads the fixture at the right, rapid advance table to left, feed table to mill piece on the right while operator unloads and reloads the fixture at the left. Then the cycle is repeated.

As in string milling, effective use of reciprocal milling is possible only if the milling time is sufficiently great to allow the unloading and reloading of one fixture while milling the part in other fixture. If the milling time is too short, the progress of the operation must be stopped while completing the loading of the other fixture. For this reason and to insure safety in operation, the machine cycle is usually arranged so that the machine table stops automatically after reversal, halfway between its extreme working positions, following milling of the piece in one fixture and before milling the piece in the other fixture. To complete the cycle, the operator must then operate the starting lever.

Combined Reciprocal and Abreast Milling

RECIPROCAL MILLING can be combined with other methods such as abreast milling to gain the advantages of both methods in reducing the time per piece. If n_a is the number of pieces placed abreast in each fixture, the time per piece for the combination is:

$$t_c = \frac{t_m + t_l + T_a}{n_a}$$

The production rate is evidently increased directly as the number of parts abreast. This is the case in Fig. 3, where the method is used in milling the inside bosses of steering knuckles.

A special manufacturing milling machine is employed for this milling operation. It is built from standard base and table units, with a special headstock containing two spindles. The spindles revolve in opposite directions for the purpose of directing the thrust of the cutters against the supporting surfaces of the machine table for best results.

The cycle of operation is the same as that of Fig. 1, and the production rate is 150 pcs per 51-min. hour. Time per piece would be obtained by:

$$t_c = \frac{t_m + t_l + T_a}{2}$$

and then substituting for t_m, t_l and T_a the estimated values determined from the conditions of the setup.

Box Milling

IN BOX MILLING the motion of two slides at right angles to each other is automatically co-ordinated so as to mill the four sides of a square opening. The process may be used alone or in combination with other methods. In the application shown in Fig. 4, box milling and reciprocal milling have been employed for milling the edges of the square opening of washing machine tubs.

In addition, further to reduce the time per piece, four milling cutters are mounted on a vertical head, as shown diagrammatically in Fig. 5. Center distance of the cutters is equal to half the length of the side of the square to be milled.

The vertical head is mounted on a ram which moves in and out, at right angles to the machine table. The automatic cycle of operation is obtained by alternately moving the ram and the table, as the milling of the four sides of the square opening proceeds in the directions indi-

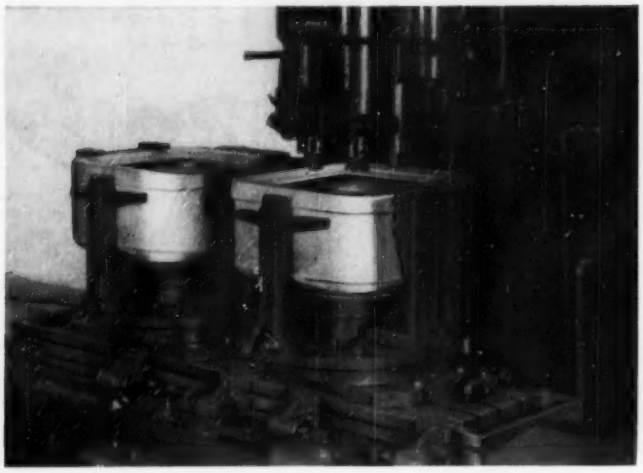


Fig. 4 . . Edges of the square opening of a washing-machine tub are box milled by co-ordinating the motion of two slides. Two fixtures are set up on special machine for combined box and reciprocal milling

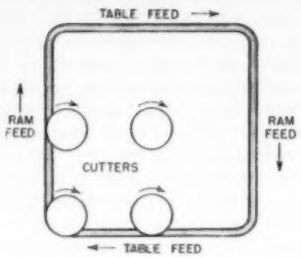


Fig. 5 . . Relationship between cutters and the square opening of the washer tub in box milling

cated by the arrows in Fig. 5. Adjustable positive stops accurately control the travel of the ram and the table during the milling operation.

The detailed cycle of operation on the first workpiece is:

To place the cutters and workpiece in correct relative position for milling, the vertical head moves rapidly down into position within the tub opening. Then the table feeds to the left a distance limited by a preset positive stop. The two cutters on the right are then in contact with the workpiece and at the required depth of cut.

Milling of the edges now begins. First, the ram feeds toward the front of the machine until two outer cutters, parallel to the table, contact the corresponding side of the tub opening. The ram now contacts a positive stop. The table then begins to feed to the right up to the positive stop; then the ram resumes the feed in the return stroke to mill the left side of the tub parallel to the ram. After contacting the positive stop, the ram halts and the table begins to feed to the left to mill the inner side of the tub parallel to the table. When the table stops, the ram again feeds out to complete milling the balance of the right side of the opening.

The table will now move right to disengage the cutters, and the vertical head moves up. The positive stop swings out of position to permit the table to rapid traverse to the right and bring the tub in the second station into position for milling. The cycle of operation is then repeated on the second tub.

The operator unloads and reloads the first fixture while the second tub is being milled. The total time is one minute for the two tubs, and the time per piece thus will be 0.5 min. This results in a production rate of 102 pcs per 51-min. hr.

Progressive Milling

Progressive milling is a method of milling used when performing two or more similar or different operations either simultaneously or successively on separate identical parts on the same machine. This method saves cost of equipment and setup time, and is especially useful when runs are short.

Progressive milling is combined with various other methods. In the example shown in Fig. 6, progressive milling is combined with abreast milling.

In one station of the two-station fixture, one end of the piece is form milled to a radius by a convex, form-relieved cutter; and in the other station, the opposite end of the piece is form milled to a bevel surface.

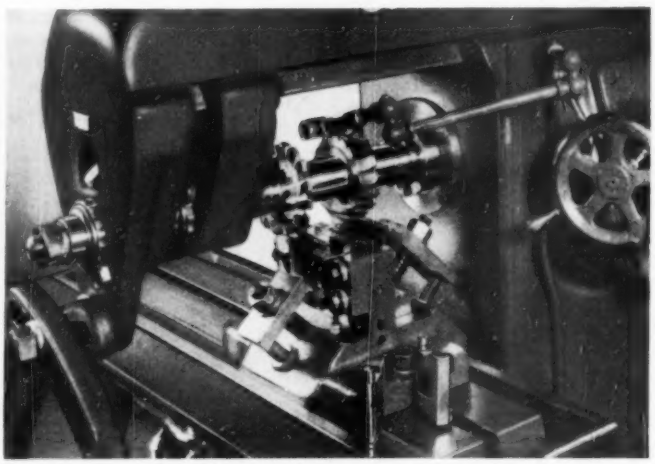


Fig. 6 . . Progressive milling is employed for forged-steel locking devices placed abreast on an automatic knee-type manufacturing milling machine

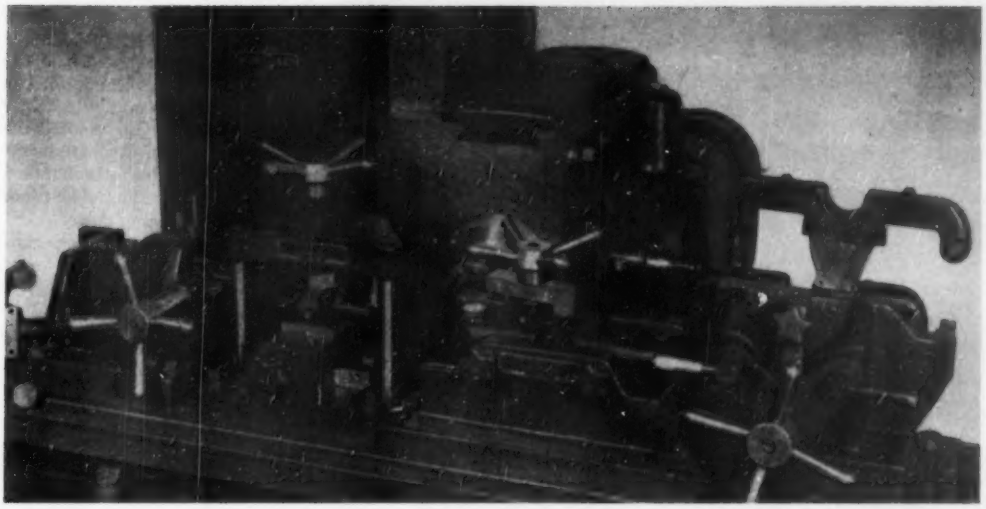


Fig. 7 . . Exhaust and intake manifolds are machined by a combination of reciprocal, progressive and string milling methods. The diagram shows the cycle of operations

In the cycle of operation, the piece which is milled in the first station is subsequently placed in the second station to mill the opposite end. The time per piece to complete the two operations is the same as though a single piece were milled, but two operations are performed with one setup, rather than the two which would normally be required. Thus, substantial savings are obtained in not only the time required for the operation but also in equipment and cost of the operation.

Progressive, String and Reciprocal Milling

A COMBINATION of progressive, string and reciprocal milling of two different parts on the same machine is shown in Fig. 7.

When operations on two different parts are combined on a single machine, the operation which requires less time is penalized in favor of that operation having the longest time cycle. This is not the case in the present example, however, since the operations consist of milling the assembly faces and carburetor assembly pads, approximately equal in length of cut, on both exhaust and intake manifolds.

Four hand-clamped fixtures are aligned along the table of a standard milling machine. The two fixtures at the left end of the table each hold an intake manifold, while the two fixtures at the right end of the table each hold an exhaust manifold.

The fixtures are arranged with respect to the cutter so that the operator may remove and load the manifolds in one pair of fixtures while the manifolds in the other pair at the opposite end of the table are being milled. Parts are moved progressively from the first to the second fixture in each set.

The cycle of operation is:

Rapid traverse left, feed to mill assembly faces on exhaust manifold, rapid advance left, feed to mill carburetor assembly pad on exhaust manifold, rapid return to center of table and stop; rapid advance right, feed to mill carburetor assembly pad on intake manifold, rapid advance right, feed to mill assembly faces on intake manifold, rapid return left to center of table and stop.

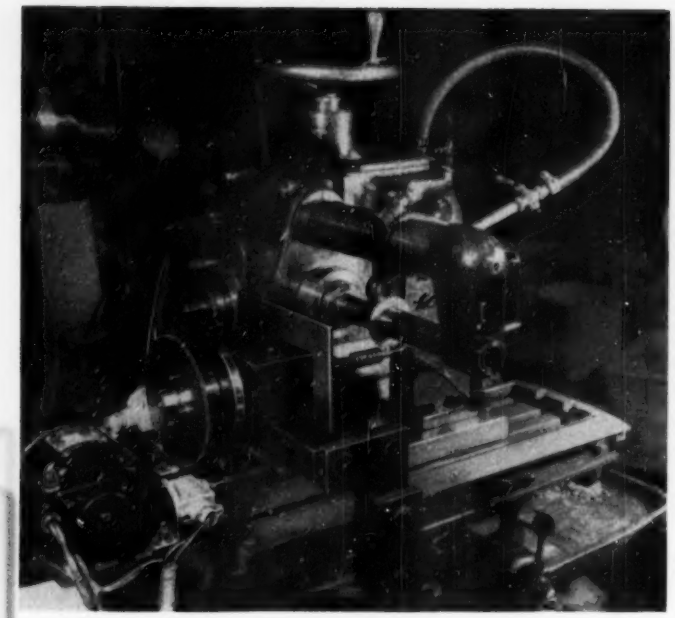
Thus, one intake manifold and one exhaust manifold will be finish-milled with each complete automatic reciprocating cycle of the machine table.

The time per piece for this combination of string, progressive and reciprocal milling is the same as that obtained by treating the two different milling operations for a half-cycle as a single reciprocal milling operation on one piece, since the gain of string milling is canceled by the use of progressive milling.

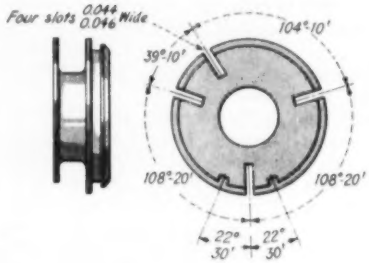
Therefore, in general terms, the time per piece is the same as that given by the formula for reciprocal milling. The actual values of t_m and t_l must be determined, from the conditions of the set-up, by calculating the total length of table travel at the feeding rate and the total length of table travel at the rapid traversing rate, for half of the machine cycle. Output rate is calculated from $P_R = 60\ E/t_c$.

For the application shown in Fig. 7, the production rate results in 48 exhaust manifolds and 48 intake manifolds for each 51-min. hr. This production rate was made possible by the additional use of a shell end mill with sintered carbide blades, which permitted operating at a cutting speed of 270 fpm and removing 1/16 in. stock of 180 BHN cast iron at 30 ipm feed.

The concluding instalment on production-milling processes will appear in Sept. 4 AM.



Motor-driven fixture performs all indexing operations required for milling unequally spaced slots in carry drums. Operator inserts arbor and starts machine. Cycle then is fully automatic until machine stops after all slots are cut. Standard production for milling and burring four slots is 74 pieces per hour



Carry drum has slots of unequal spacing and close tolerances. Slots are in relation to center of flat at bottom of flange. Part is steel

Automatic Indexing Fixture Mills Unequally Spaced Slots

Burring, checking, and pre-loading of arbors is performed during milling to give low cost on a close-tolerance operation

BY PAUL JANKE, Tool Engineer
MONROE CALCULATING MACHINE CO., ORANGE, N. J.

UNEQUAL indexing is performed automatically in a special fixture developed at Monroe Calculating Machine Co. Operating on a Sundstrand milling machine with automatic cycle, the fixture eliminates all manual indexing and makes it possible for the operator to perform burring, checking, and loading operations during the machining cycle.

The setup is designed for milling unequally spaced slots in steel carry drums, which are a part of the computing mechanism of Monroe calculating machines. As spacing is not the same in all drums, the fixture has been designed for easy changeover from one indexing sequence to another. Further, as the functioning of the drum in the assembly sets high requirements as to accuracy, slots must be held within close limits.

Eight pieces are slotted at once on an arbor driven by a shaft carrying a master index plate. This plate is approximately four times as large as the drum and contains tapered holes laid out according to the spacing desired for the slots. A spring-loaded tapered pin enters one hole to lock the arbor in position during each milling cut.

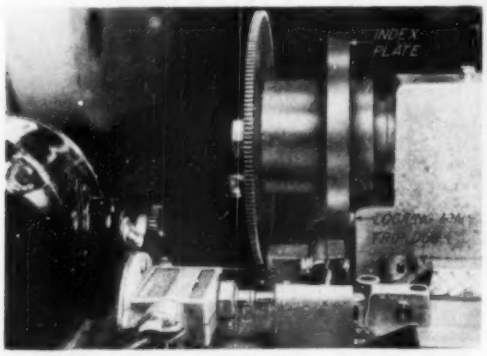
After the table returns far enough so the cutter clears the work, a trip dog withdraws the pin and simultaneously closes a limit switch. This starts a drive motor, which rotates the shaft through a friction clutch and gearing until the locking pin enters the next hole. Engagement of the pin opens the limit switch, stopping the motor, and the machine makes the next cut. The cycle is automatic and repeats until the plate gets back to the first position.

At this position a cam surface on the index plate closes a second limit switch at the rear of the table to shut off the machine. The operator removes the completed arbor, inserts the next arbor, and starts the machine.

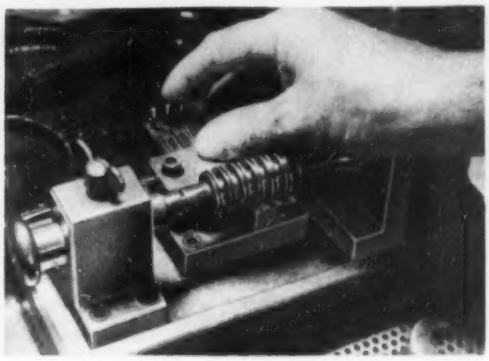
During the machining time, the operator unloads the arbor, removes all burrs from the eight slotted drums, and checks the slots in dial-indicator fixtures located on a bench near the machine. Centrality must be held within ± 0.001 in. and width within a total

tolerance of 0.002 in. He then loads the arbor for the next cycle. In loading, drums must be positioned on the arbor so all slots will be in correct relation to a flat on the drum. To obtain this location quickly and positively, a loading fixture has been provided.

In operation, the indexing fixture permits as extremely low ratio of handling to total cycle time, as inserting and removing the arbor is a quick operation. Flexibility is provided as it is only necessary to change index plates to set up for a different combination of slot spacing. At the same time, slots are accurate and the danger of human error in indexing is eliminated. Positive location is provided and the ratio of master index plate to work reduces the inaccuracy that creeps into the setup from wear on the locking pin or the holes. These factors, the excellent gaging facilities, and a skillful operator who changes each cutter before it is producing a heavy burr, combine to give fast production of high quality on a precision job.



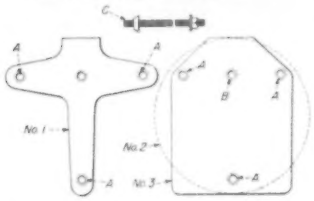
Indexing mechanism consists of plate with holes positioned according to spacing of slots in work. Spring-loaded taper pin locks plate in position during cut. As table returns, trip dog pulls out pin and actuates limit switch to start motor and turn index plate to next position



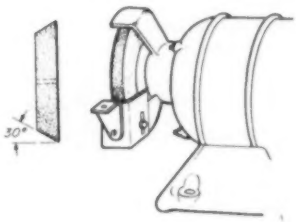
Loading fixture aligns part on arbor so flat is in correct position for slotting. Part is rotated on arbor until positioning bar slides beneath. When all flats are in position, arbor nut is tightened and arbor is ready for machine. Operation is done during milling

Short Cuts FOR THE SMALL SHOP

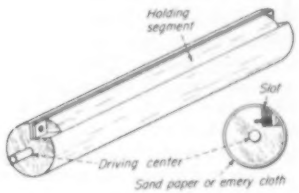
BY CHARLES L. LEEPER



SWIVEL BASES for vises that can be used on the bench and quickly transferred to the drillpress can be made in several styles. Three shapes are shown in items 1, 2 and 3. All three, made of ½-in. plate, have three holes *A* for mounting the vise and a hole *B* for the locking screw *B*. Holes *A* and *B* are drilled, then countersunk from the bottom side. Flat-head screws are driven home in holes *A* to project above the base, and the surrounding metal is drifted so they will not come loose. Special screw *C* is screwed into the hole *B*, is filed flush, and prick-punched so that it will not come loose. Screw *C* is long enough to pass through the bench top.



PARTS OF ANY LENGTH can be ground straight on a bench machine if the wheel face is dressed to a 30° angle. With an angular wheel face, as the wheel gets smaller from dressing, the work will not strike the grinder base or motor housing.



ABRASIVE - COVERED ROLLERS are handy for many purposes. To make one that accepts standard-width sheets of silicon-carbide or sandpaper abrasive, proceed as follows: Select a piece of hard maple or hickory longer than the sheet, drive a center in one end and countersink the other end. Turn the OD until the circumference is ¾ in. less than the width of the abrasive sheet. Next, cut out a lengthwise segment. Cut away the ends of the segment to provide clearance for woodscrews. Lay the abrasive sheet onto a board exactly as wide as the roll circumference and crease over each edge ⅜ in. Slip these creased edges into the slot and tighten the woodscrews. When the abrasive sheet must be replaced, it can be changed quickly and easily.

INDEXING FIXTURES APPLIED TO SPOTWELDING

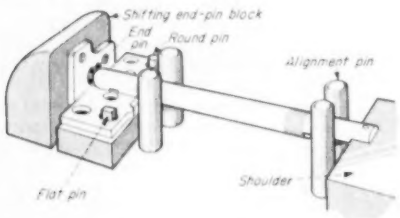
Projection welder joins telephone-relay cores and mounting brackets at rate of 1400 per hr. Components are dumped in two pans. Finished assemblies are kicked from fixtures to slide down chute to tote pan

BY O. STENSON, Design Engineer
and W. R. SPICK, Product Engineer
Hawthorne Works, WESTERN ELECTRIC CO.

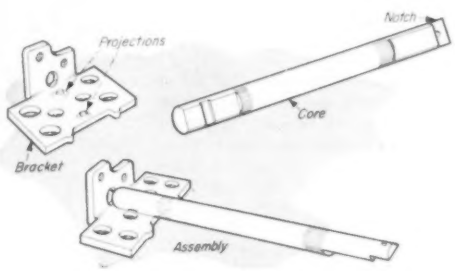
LIKE a dial-feed device for a punch-press operation, eight fixtures rotate under an automatic spotwelder to turn out small, simple assemblies for telephone relays. The two parts are a punched-and-bent bracket that is drilled and tapped through two holes in the tab; and a 3½-in. rod that is straight-knurled in two places, broached at both ends, and drilled through the notched end.

Parts are fed by the operator from a special loading bench to the fixtures as the 15-in. table rotates slowly. A kick mechanism working from the welding head and synchronized with the welding cycle knocks completed parts into a chute. Handling the small parts with this semi-automatic method maintains high production and keeps operator fatigue at a minimum.

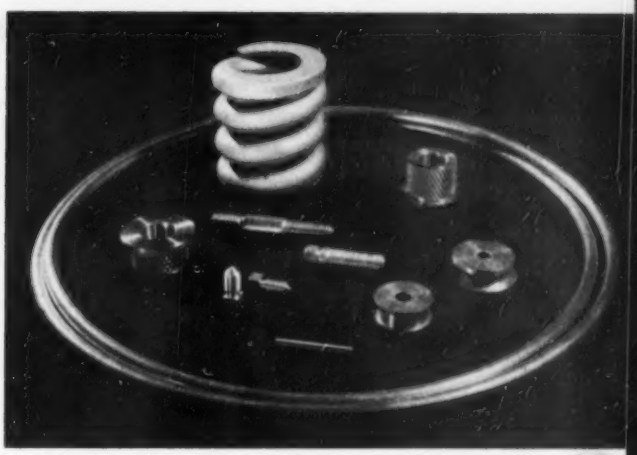
Indexing table has eight fixtures, runs at 2 rpm. Rotation is tied in with automatic cycling of 100-kva welding head, so all operator does is locate both parts in fixture



Fixture has one round pin, one flat pin to locate bracket. Core is positioned between two pairs of round pins, and notched end is located against shoulder on fixture by pin working through hole in bracket



Bracket has two 1/16-in. projections which are upset by spotwelder. **Core** has one notched end, one broached-flat end. Core must be square with holes in bracket within 0.010-in. at outer end



Carbon and alloy steels may lose carbon from the surface layers during heat-treatment, producing a condition that makes fabricated parts and tools useless or dangerous in the service

CARBON RESTORATION OVERCOMES *'Soft Skin'* ON PARTS

BY E. C. BISHOP
METALLURGICAL ENGINEER
Materials Engineering Department,
WESTINGHOUSE ELECTRIC CORP.

STOP throwing away steel parts and tools found to have a soft skin. The decarburized surface can be restored to the original carbon content by batch or continuous heat-treatment. Fully automatic generators of suitable furnace atmospheres carry out the process with trouble-free operation. Often carbon restoration can be combined with hardening or annealing.

Carbon restoration is not a difficult control problem. The dewpoint of the atmosphere generated for the furnace is the key to successful operation. Dewpoint is easily measured or recorded. For carbon steels, a simple chart gives the dewpoint of an atmosphere with the correct carbon-replacing potential for the process temperature used. In the case of alloy steels, an estimate derived from the chart and a trial run or two will establish the suitable conditions for the recarburization treatment.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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BASIC PRINCIPLES OF CARBON—

CARBON restoration may be defined as replacement of carbon to the surface of a steel part, which has been depleted of that element, *up to the carbon content of the remainder of the part as a whole*. The italics differentiate carbon restoration from ordinary carburization, where addition of carbon to the surface of a steel part is considerably above the carbon content of the part as a whole. Moreover, it is this distinction which places the extra burden of precise control on the carbon restoration process.

In straight carburization, precise control of the carbon content of the surface resulting from the treatment is not usually necessary. On the other hand, in carbon restoration the decarburized skin must have its carbon replaced to exactly the same content as that existing in the remainder of the part and maintained throughout the entire section of the piece often to within 4 to 6 points of carbon.

Such requirements entail that the medium for carbon restoration, whether gaseous, liquid, or solid, must be inherently capable of adjustment to any "carbon potential" within the normal carbon contents of commercial steels. Carbon potential may be defined as the carburizing tendency of the medium, or the carbon content produced in a piece of infinitely thin steel strip in contact with the carburizing medium at the carburizing temperature. In other words, an equilibrium must be established between the carburizing medium and the desired surface carbon content or the existing carbon level in the core of the steel.

Solid and liquid carburizers are not inherently capable of this adjustment to a desired equilibrium condition. However, certain atmospheres, prepared from air and natural, bottled, or manufactured gas can be brought to equilibrium with respect to the carbon content of most commercial steels.

The products of reaction of any one of these gases with air produces an atmosphere containing H_2, H_2O, CO, CO_2, N_2 and residual CH_4. Considerable data exist to demonstrate that, at any given temperature, the carbon content of a steel heated in the presence of these gases will be determined by the ratio of H_2 to H_2O and CO to CO_2. See references 1 and 2.

In general, at normal heat-treating or carburizing temperatures these ratios must be quite high, since H_2 and CO are reducing and H_2O and CO_2 are oxidizing or decarburizing gases. Nitrogen is inactive, while CH_4, present in small quantities, is considered merely the agent to supply the carbon for the carbon restoration process, having, *per se*, no effect upon the ultimate surface carbon content obtained in the steel.

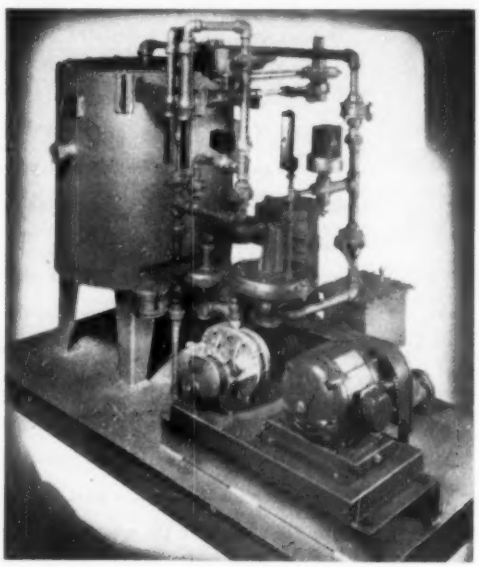
The precise ratios necessary to produce a desired carbon content in the steel may be calculated from thermodynamic data and can be found variously in the literature on the subject. See references 2 and 3. A simpler and close approximation to these control variables can be made.

Consider an easily and economically prepared atmosphere capable of equilibrium adjustment and successful in the field of carburizing and carbon restoration. This atmosphere is produced by the endothermic reaction of a rich air-gas mixture over a suitable catalyst heated in an alloy retort to approximately 1900 F. Nominal analysis of the "Endogas" atmosphere produced from natural gas is:

H_2	36 — 40%
H_2O	0.10 — 2.00%
CO	18 — 20%
CO_2	0.0 — 1.0%
CH_4	0.0 — 1.5%
N_2	Balance (38 — 43%)

Accurate control and adjustment of the proportion of air to gas permits precise regulation of the relative quantities of these gases, particularly the H_2 to H_2O and CO to CO_2 ratios.

Assume that for the desired carbon potential, certain H_2/H_2O and CO/CO_2 ratios are required (by calculation or experimental data). In varying the generator air to gas proportion to obtain these desired ratios, the relative quantities of the high percentage gases (H_2 and CO) change little (1-4%). Hence the desired ratios are achieved primarily through regulation of the small amounts of the low-



Furnace atmospheres of two types cope with 95% of carbon-restoration problems. This "Endogas" generator produces the "20-40" atmosphere (roughly 20% CO-40% H_2) for use with carbon and alloy steels

percentage decarburizing gases (H_2O and CO_2).

Moreover, a change in one of these gases automatically fixes the change in the other by virtue of the "water gas" reaction:

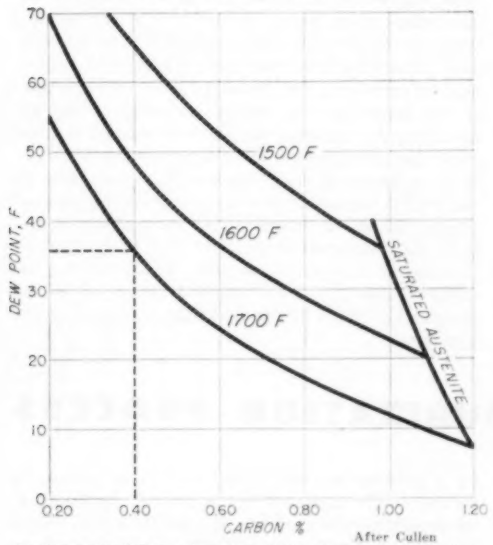
$$H_2O + CO \rightleftharpoons H_2 + CO_2$$

Thus, it becomes necessary to determine only *one* of these gases to fix the two ratios involving all four gases.

In practice, as H_2O content can be determined more easily and accurately than CO_2 content, the moisture of the atmosphere, or its "dewpoint," is used as the atmosphere control. By measuring the dewpoint, the effective H_2/H_2O and CO/CO_2 ratios are determined and the carbon potential of the atmosphere evaluated. See references 3, 4 and 5.

All that is required to relate the desired carbon content in the steel to the composition of the furnace atmosphere is a plot of percent carbon in the steel versus the "dewpoint" or water-vapor content of the atmosphere in *the furnace*. The higher the desired carbon content, the drier must be the atmosphere.

Although complete data are not available for all temperatures, most processes are carried out in the temperature range covered by the accompanying chart. As the plot is strictly applicable to plain carbon steels, its use with alloy steels must be undertaken with caution. In general, this curve may be used with reasonable accuracy on low- and medium-alloy steels, providing alloying elements that tend to promote decarburization, such as silicon and molybdenum, are not present. In such cases, the curve may be used as a guide, making an empirical allowance for the effect of the alloying element, and the precise dewpoint is determined by test runs. Much latitude in dewpoint can be tolerated when operating at a temperature of 1650 F or below.



After Cullen

Carbon potential is a function of the dewpoint of the furnace atmosphere, as produced at the generator. Example of dewpoint and temperature selection: SAE 1040 screw stock can be recarburized at 1700 F without grain coarsening, if the "20-40" atmosphere has a dewpoint of 36 F

Once complete carbon restoration of the decarburized layer has been effected, the steel may be left in contact with the atmosphere for an indefinite time. No further change in the carbon content will occur, as long as the dewpoint is maintained correctly.

The above considerations apply only to the atmosphere manufactured by the endothermic type of generator. This atmosphere, referred to hereafter as the "20-40" type (20% CO40% H_2), has demonstrated versatility, reliability and economy.

Other atmospheres are superior for special applications. Of these, the exothermic type, CO_2 free and dried, will be briefly mentioned. It, with the endothermic type, is used for probably more than 95% of all carbon-restoration processes.

Termed "Monogas" by the Westinghouse Electric Corp., this atmosphere is prepared by burning leaner air-gas mixtures to produce the following analysis:

H_2	0 — 15%
H_2O	1.0 — 2.0%
CO	0 — 12%
CO_2	5 — 12%
CH_4	0 — 1.5%
N_2	Balance (65 — 87%)

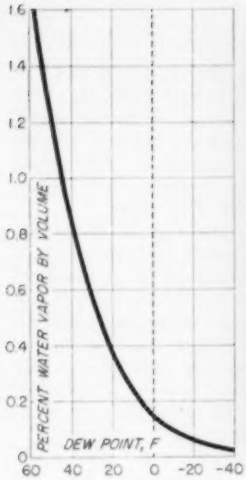
The H_2/H_2O and CO/CO_2 ratios are much lower than required to maintain appreciable carburizing power. To remedy this H_2O and CO_2 are reduced to low values by drying over activated alumina to remove the H_2O and scrubbing with special solutions to remove the CO_2. Dewpoints of approximately −40 F and CO_2 contents of about 0.02 to 0.05% are normally obtained. Equipment necessary for the preparation of this atmosphere makes an installation relatively more expensive than in the case of the "20-40" atmosphere.

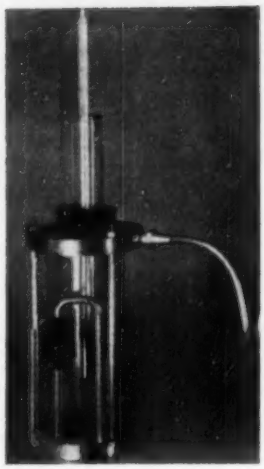
Primarily, the exothermic atmosphere is useful in annealing. During annealing of steel, the material must be cooled slowly to relatively low temperatures. If the endothermic-type atmosphere (high in CO) is used, the following reaction occurs:

$$2\ CO \rightleftharpoons CO_2 + C$$

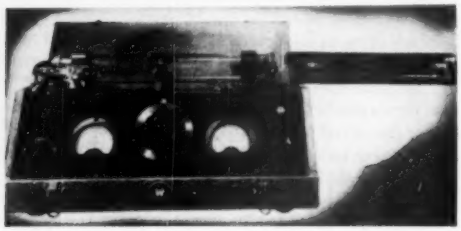
This means that soot is deposited over the charge and furnace interior. This condition can virtually be eliminated by employing the exothermic-type atmosphere and regulating the air-gas ratio to produce only 1-2% CO.

With the exothermic type of atmosphere, it is possible, but only at low annealing temperatures,





Dewpoint, the temperature at which water vapor from a furnace atmosphere condenses, is a function of the water content of the gas. Instruments to check this property are: a mirror-type dewpoint apparatus, a carbon potential indicator, both illustrated, and continuous recorders



to regulate the quantities of the various gases and additions of methane, so that restoration of carbon to decarburized skin may be accomplished. Furthermore, the low percentage of "active" constituents, H_2, H_2O, CO, and CO_2, mean the atmosphere is less sensitive in adjustment to the desired carbon potential. However, it is difficult to obtain the high carbon potentials required at higher temperatures, and the *rate* of carbon restoration is much slower than for the "20-40" type atmosphere. See reference 8. For these reasons, plus the higher initial cost of the equipment, its use has been restricted for the most part to the annealing of steel.

CARBON-POTENTIAL CONTROL INSTRUMENTS

Commercial instruments are available for carbon-potential control.

The simplest control instrument, and quite satisfactory in its way, is the common dewpoint apparatus. This device consists of a cup, polished to a mirror-like surface, about which flows the stream of gas being sampled from the furnace. The cup is filled with a low-freezing-point liquid, such as acetone. By cooling the mirror cup with dry ice, the moisture from the atmosphere forms as a dew on its surface. The temperature at which this phenomenon occurs is called the "dewpoint" and is a direct function of the water vapor content of the atmosphere. This property of the atmosphere has been so widely used in the controlled-atmosphere field that conversion to percent water vapor is seldom made; the dewpoint temperature is usually employed directly.

Commercial dewpoint recorders function automatically and provide a continuous record of the dewpoint.

A relatively inexpensive type of control instrument, which employs a different principle, is the carbon-potential indicator. In this instrument a fine iron wire is resistance heated to the carburizing temperature in atmosphere sampled from the furnace. The wire is heated until it reaches an equilibrium carbon content throughout its cross-section, as determined by the carbon potential of the atmosphere. At this point the power is shut off and the wire "gas quenches" to room temperature in a matter of a second or two. The electrical resistance of the wire is then measured by a built-in wheatstone bridge. In the as-quenched or martensitic condition, the resistance of the wire is a very sensitive function of its carbon content. It follows that an arbitrary measure of the carbon potential of the atmosphere is found in the electrical resistance of the test wire.

STEPS IN THE RECARBURIZATION PROCESS

STEPS that should be taken in order to restore carbon to a decarburized piece of steel are:

1. DETERMINATION OF DECARBURIZATION

To determine the time required to restore the carbon lost from the surface of the part, estimate the depth of decarburization. This information may be obtained by micro- or macro-scopic examination, by a hardness survey, if the part is in or can be treated to the hardened and tempered condition, or by actual carbon analyses of successive cuts taken from the surface toward the core.

If microscopic examination will be used, examine the thermal history of the part. In the as-quenched or quenched and tempered condition, only rarely can the depth of decarburization be determined accu-

rately. Normally, only total decarburization (free ferrite) can be seen, while dangerous partial decarburization (partial loss of carbon) is unnoticeable. Hence, the piece should be quickly austenitized and *slow cooled* to give a pearlitic structure.

Air cooling may be too rapid for thin sections or deep hardening steels, since suppression of ferrite may occur, or the transformation to bainite or martensite may take place. Cool the part at a rate such that formation of ferrite is not suppressed. The resultant pearlite-ferrite structure of the core should be characteristic of virtually equilibrium cooling for the steel in question.

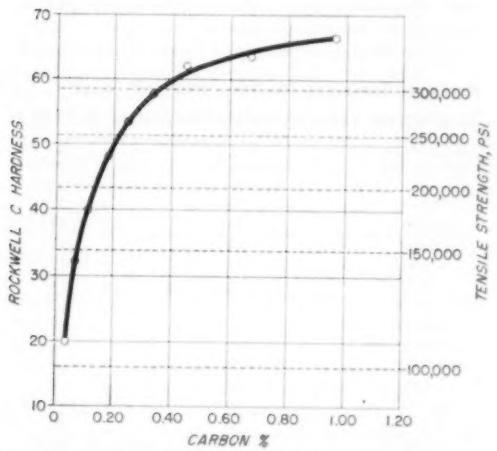
A hardness survey on a section through the as-quenched or quenched and tempered piece may be employed for an accurate estimate of decarburization, provided the normal or core carbon content does not exceed 0.70%. On steels of higher carbon content this method is unreliable because hardness is not sensitive to carbon in the higher ranges. Etching and macroscopic examination of depth of decarburization can be used only as an approximate test.

If an extremely precise determination of decarburization is desired, successive layers may be machined from the part and analyzed for carbon until the core analysis is attained. In this way, the depth of decarburization may be obtained as well as a carbon-gradient curve.

2. TEMPERATURE OF CARBON RESTORATION

Selection of temperature for carbon restoration will be affected by these factors:

(a) Time available for recarburization (if limited)
(b) Grain growth
(c) Limitation of the atmosphere
(d) Use of a thermal treatment in conjunction with carbon restoration



Hardness of quenched steel is related to carbon content, and is a reliable indicator if normal carbon content does not exceed 0.70%. This chart can be used with hardness surveys of a section to determine the degree of decarburization that has occurred in the sample

To minimize treatment time, use as high a temperature for recarburization as is consistent with limitations in respect to grain growth, concomitant thermal treatment of the material, and the atmosphere available. Excessive grain growth is normally to be avoided, and the grain-coarsening temperature of the steel should not be exceeded.

Limitations of the atmosphere must be considered. With a "20-40" type atmosphere, the lowest dewpoint conveniently available is about −4 F. Except in alloy-muffle furnaces, the lower limit of dewpoint attainable in the furnace will be above this value, depending upon tightness of construction and methane additions. Hence, the temperature of the carbon-restoration treatment may have to be lowered from the optimum, so that the furnace dewpoint is around +15 to +5 F.

Where hardening or annealing is performed on the steel in conjunction with carbon restoration, the temperature can be chosen to make such treatment possible. Atmosphere requirements must stay within reason, and the time required for carbon restoration must not become excessive. As a general rule, carbon restoration below 1400 F proceeds so slowly that, except for small depths of penetration, it is not feasible.

3. REGULATION OF THE ATMOSPHERE

Atmosphere requirements are determined by two factors: (1) the surface or equilibrium carbon content desired, and (2) the total quantity of carbon necessary to recarburize completely all depleted areas of the charge.

The first factor, in conjunction with the temperature of treatment, fixes the dewpoint of the atmosphere as previously demonstrated. It is necessary only to decide upon the temperature and the carbon content desired at the surface to determine from curves the furnace dewpoint required.

The second factor influences the amount of CH_4 to be added to the base gas, to supply carbon necessary to recarburize the depleted areas of the charge. As pointed out previously, this CH_4 addition has no effect upon the *surface carbon content* obtained, except insofar as it may react in the furnace to lower the dewpoint. Furnace dewpoint still remains the factor which determines the surface carbon content obtained. CH_4 is used to supply this carbon, since it will do so at a rate more than one thousand times greater than will CO, a relatively weak carburizer. However, the quantity added should be kept to a minimum, since breakdown of the gas in the furnace results in excessive soot deposition.

Calculation of the amount of CH_4 to be added to the base gas is tedious and seldom justifiable in view of questionable assumptions that must be made. For all practical purposes a satisfactory solution can be achieved by shrewd guess work and test runs. Where charges involving relatively small surface areas are used, the 1.0-1.5% CH_4 usually found in the generator atmosphere will suffice to supply carbon at a rate equal to or greater than that at which the parts will dissolve it. However, if charges of a large

quantity of small parts, involving greater surface areas, are employed, it may be necessary to add a few per cent of CH_4 to the base gas. Trial and error will quickly determine the amount necessary, which seldom need exceed 4-6%.

4. PREPARATION OF THE CHARGE

The steel should be clean and free from scale (a thin oxide is quickly reduced and offers no barrier to the carbon restoration process). The pieces should be loaded into the furnace in such a way that the atmosphere will have free access to all areas to be recarburized. Point contact between adjacent pieces is permissible. To prevent carbon pickup on certain areas of a piece, copper plate them.

A minimum of time should be spent in placing the charge in the furnace, since prolonged opening of the door, in the case of bricklined box furnaces, prevents rapid purging of oxygen and water vapor from the furnace after the door is closed. As water vapor of the atmosphere in the furnace is the controlling factor during carbon restoration, this matter is of vital importance.

5. TREATMENT

To attain uniform carburization, the contact of the atmosphere with the charge at all points must be assured by adequate flow and if necessary by fan circulation.

In continuous furnaces, it may be desirable to conduct carbon restoration in two stages by the use of two heating zones. A highly carburizing atmosphere is employed in the first zone to promote rapid build-up of carbon in the material. Rate of carburization is a function of the difference in carbon potential of the atmosphere and the steel. An atmosphere of the finally desired carbon potential is used in the second or "diffusing" zone.

Such conditions may be duplicated in batch-type equipment, by using a richer atmosphere for the initial part of the cycle, and the equilibrium atmosphere for the final cycle.

Following carbon restoration, the steel is cooled according to the metallurgical requirements for the part. A conventional quench may be given tools, provided the temperature for carbon restoration coincides with the normal hardening temperature range for the steel.

If carbon restoration has been carried out in conjunction with annealing, care must be exercised in adjusting the carbon potential of the atmosphere as the steel is cooled in the furnace. A carbon potential that is correct at the annealing temperature will carburize the steel at lower temperatures.

PRACTICAL EXAMPLES OF CARBON RESTORATION

APPLICATIONS of carbon restoration at the Westinghouse Electric Corporation include:

Bolt Stock

Decarburization of SAE 1040 bolt stock occurred as a result of hot rolling. By metallographic examination it was established that approximately 0.012 in. decarburization existed.

Although the possibility of grain coarsening was present, carbon restoration was carried out at 1750 F, to judge the effect of rapid replacement of carbon at this high temperature. A dewpoint of +27 F was picked. Samples were held 3½ hr at temperature to demonstrate the equilibrium characteristic of the "20-40" type atmosphere. A much shorter time would have sufficed to complete carbon replenishment of the decarburized skin.

The samples were cooled in the water-jacketed cooling chamber of the furnace, a treatment tantamount to normalizing. For this type steel the cooling rate was not rapid enough to cause suppression of ferrite or give a deceiving structure in the metallographic determination for carbon.

A photomicrograph revealed that grain coarsening was excessive, although carbon restoration had been satisfactory with the formation of a substantially uniform carbon content from core to surface. Hence, in the second test the temperature was dropped to 1700 F, and a dewpoint of +36 F was chosen. Again, a longer time than necessary, 4 hr, was employed for the recarburization. This period was chosen to demonstrate that once carbon restoration to the desired level was completed, an equilibrium condition was established.

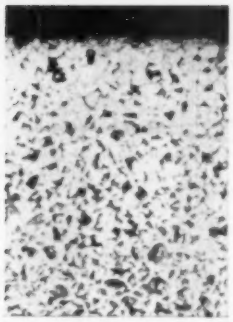
From structure of the sample it was seen that carbon had been restored to the decarburized layer at a level constant from core to surface and equal to that of the core. Moreover, grain growth had been suppressed and a uniform grain size existed throughout the cross-section of the piece.

As an additional check, a piece of the sample

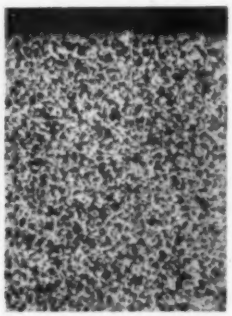
Hardness Traverses for SAE 1040 Bolt Stock Demonstrate Value of Carbon Restoration at 1700 F

DISTANCE FROM SURFACE, IN.	ROCKWELL C HARDNESS*	
	AS-RECEIVED	CARBON CORRECTED
0.000	35	56
0.002	35	56
0.004	39	57
0.006	41	57
0.008	38	57
0.010	36	57
0.012	41	57
0.014	49	57
0.016	50	57
0.018	53	57
0.020	53	57
0.025	55	56
0.030	56	55
0.035	55	56
0.040	56	55

*Converted from diamond-point hardness using 10-kg load. Samples brine quenched from neutral salt.



Grain coarsening of SAE 1040 screw stock resulted from a carbon-restoration cycle carried out at 1750 F. When the treatment temperature was dropped to 1700 F and the dewpoint adjusted to suit, the carbon was fully restored while suppressing grain growth



given the second treatment and a piece as-received, were austenitized in a neutral salt bath and brine quenched. After sectioning, hardness traverses were taken on each. Tabulated data verify the conclusions drawn from the photomicrographs.

Heavy Springs

The second example concerns a heavy coiled spring for a locomotive. The 4x11-in. spring was hot coiled from 0.870 in. centerless ground SAE 6150 bar. After conventional hardening from an air atmosphere and tempering, several such springs failed in service.

Metallographic and hardness investigation of the failures established that they had been caused by fatigue brought on by the presence of a soft, decarburized surface. The loading had been beyond the fatigue limit of this soft skin, and a crack had started at the surface which rapidly progressed across the section until failure took place.

The steps taken in the manufacture of a new set of springs are given here in detail as a model solution to a typical case:

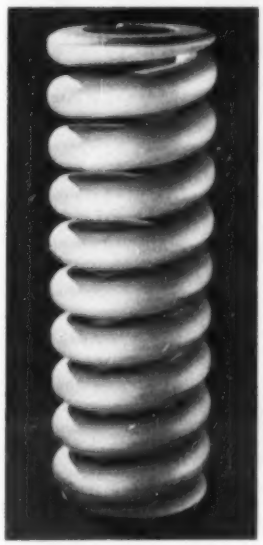
A new set of springs was fabricated as before by hot coiling, while a dummy bar of SAE 6150 was put through the identical treatments of heating for coiling, soaking, and air cooling. Although this dummy bar, on metallographic examination, revealed about 0.010 in. decarburization, the possible suppression of ferrite from moderately rapid cooling was recognized. Hence, a piece of the bar was heated rapidly in neutral salt to minimize diffusion of carbon from core to case and slow cooled in diatomaceous earth. Metallographic examination confirmed that suppression of ferrite had occurred, in the first instance, because the true depth of decarburization was approximately 0.015—0.020 in.

A temperature of 1650 F was picked for carbon restoration. This was high enough to effect fairly rapid carbon replacement yet low enough to serve as the austenitizing temperature prior to quenching. Hence, it was possible to combine the two steps of carbon restoration and hardening.

Having fixed this variable, it was necessary to estimate the time for carbon replacement and the atmosphere requirements to produce a surface carbon content of approximately 0.50%. Experience indicated that about one hour at temperature would suffice to recarburize completely the decarburized layer. By reference to the curves it was estimated that a furnace dewpoint of about +34 F would recarburize the steel to 0.50% C at the surface, provided the small quantities of alloying elements did not materially change the equilibrium conditions assumed for a plain carbon steel.

For the sake of superior fatigue strength, it was decided that a slightly higher carbon content at the surface would be desirable. Consequently, a dewpoint of approximately +26 F was employed for the treatment, producing a surface carbon content of 0.60-0.70%, to provide a higher skin hardness, after quenching and tempering, and improved fatigue resistance.

A piece of the sample bar was held for one hour at temperature in a "20-40" atmosphere with a furnace dewpoint of +26F and oil quenched. For comparison purposes another sample of the original bar was oil quenched from neutral salt at the same temperature. The two pieces were then tempered at 680 F for two hours to bring them to spring hardness. Results of Knoop micro-hardness surveys taken across sections through these two samples are illustrated. Note the change which has been wrought by



Locomotive coil springs are typical of parts of high intrinsic value and severe service requirements. To avoid fatigue failures from soft skin, it is practical to heat-treat such items in a suitable carbon-potential atmosphere

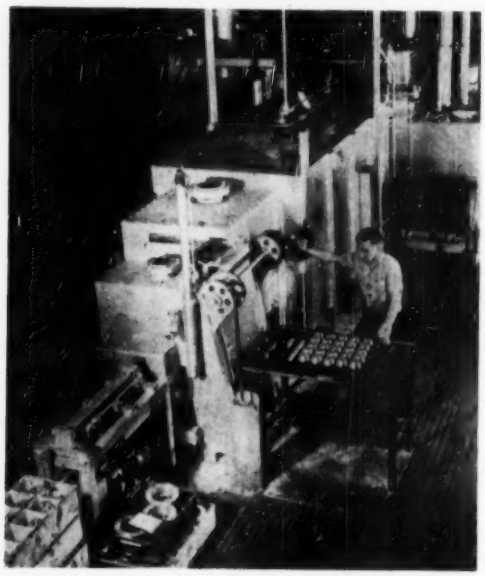
the carbon restoration treatment. The sample bar heated in neutral salt shows a decarburized soft skin extending in 0.015-0.020 in. before the core hardness level is attained. Surface fatigue strength of such a bar would be markedly below that calculated for the steel, assuming 0.50% C.

By comparison, the carbon-corrected bar exhibits full hardness throughout its section, with a slight increase near the edge due to the higher carbon content, as was planned. Such a bar would have a fatigue strength slightly above that calculated for SAE 6150, yet would retain the essential ductility and impact resistance of the core.

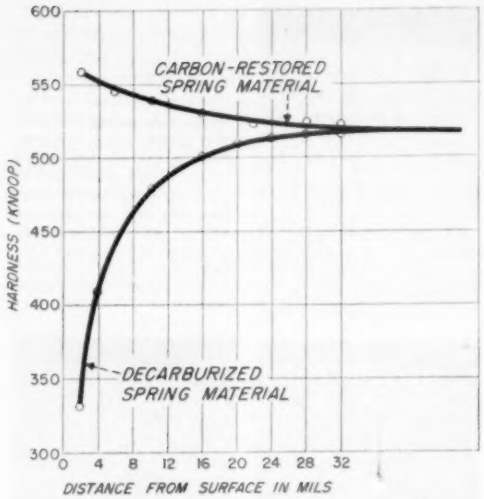
It should be reiterated that in the quenched and tempered condition it is not possible to establish the carbon gradient by metallographic examination. A martensitic structure of uniform appearance would be observed right out to the edge of the sample. Only a hardness survey or carbon analyses of successive layers of the sample could reveal this gradient. Total decarburization, of course, can be detected by microscopic examination.

Hardening of the springs presented an additional problem in that distortion during the oil quench had to be kept to a minimum. The technique employed to circumvent this difficulty was to quench by rolling a spring down an inclined ramp into the quenching oil, then rolling it back and forth on the ramp until cooled to the bath temperature. By this means it was possible to provide a uniform quench to all parts of coil practically at once and incur essentially no distortion. The springs were then tempered at 680 F to bring them to correct hardness.

In neither of the examples cited was natural gas added to the atmosphere to supply carbon for the carbon-restoration process. The atmosphere produced by the generator contained approximately 1% CH_4, which was sufficient for the small surface area of the charges used. Had charges with greatly increased surface area (small pieces) been employed or more rapid carbon restoration been required, it would have been necessary to add CH_4 to the atmosphere.



Carbon restoration can often be combined with either hardening or annealing operations on products. Fully automatic furnaces or batch-type equipment can be used



Knoop hardness surveys on samples of decarburized and carbon-restored SAE 6150 spring steel demonstrate conclusively that soft skin can be overcome and satisfactory service life of the spring assured

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6. "Homogenous Carburizing," by O. E Cullen, *Iron Age*, August 11, 1949, p83.

7. "Fundamentals of Good Carburization," by J. K. Stanley, *Metal Progress*, November 1942, p849 (Table III).

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ROUND TABLE

Sorcerer's Apprentices

"Think I can get away with drowning a couple of apprentices, Ed?" asked Al as he walked into Ed's office after the four o'clock buzzer.

"I wouldn't try it if I were you, pal. What's the trouble; more gripes from the men?"

"Yep! They say the apprentices are ruining too much work and they're interfering with our good production record. I was wondering if you'd give me an opinion on an idea before I take it up at the next foremen's meeting."

"Sure, as long as you can't get jailed for whatever it is."

"Well, look: Almost everybody around here has some trouble with apprentices. Why don't we set up a plant-wide system that will schedule all their work and assign definite instructors to keep them busy and out of mischief?"

"Wait a minute! Who do you think we are; General Motors? We can't afford to have a separate apprentice department, Al. We have enough trouble paying their wages as it is now."

"But we could save money! All we'd need would be a couple of good, all-around mechanics to work with them full time. Then we could plan out their work ahead and make sure they got taught all the fundamentals."

"I can't see it, Al. With each department responsible for its own apprentices, at least we get some productive work out of them once in a while. I assign each one here to an old hand, and if he thinks the kid can do some good, he lets him practice on something we need."

"Yeah, and half the time he ruins the job, too."

"Not always, and all he really wastes is some stock. We assume that his pay is no waste, or otherwise we wouldn't bother with apprentices at all."

"Here's another point: We could rate each apprentice, and offer them two- to five-cent bonuses for good work; maybe even put them all on incentive. That should keep them interested in working, and also teach them the importance of the production factor."

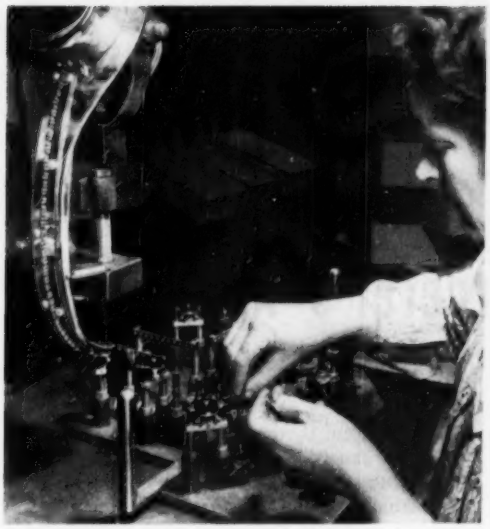
"That's throwing good money away, Al. I admit that apprentices are worth paying, but they don't even earn their base pay now, much less a bonus."

"Sure, but . . . ."

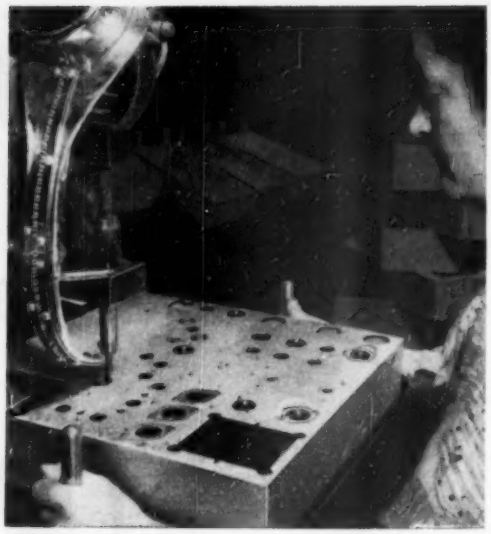
"But nothing, m'friend. In a medium-size shop like this we can't afford to set up a complete apprentice system; and furthermore, there's no reason why we can't develop good apprentices without a system."

"I don't know for sure about the economics of the idea, but I'm darned sure we could do a better job with them if we planned out the apprentice training program."

***Can small** and medium-size shops afford to establish formal apprentice programs? Or can they afford not to? Can apprentice training be done well on an informal old-timer-to-student basis? Discussions of earlier topics appear on later pages.*



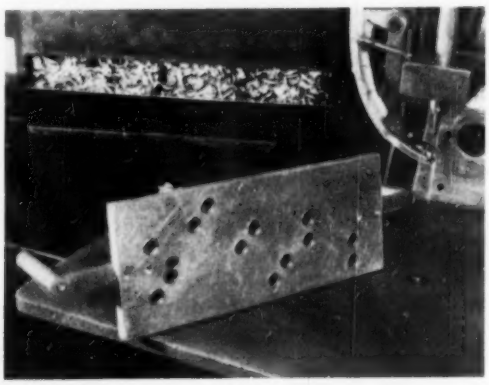
Eyeletting fixture has components pre-positioned on hardened tool steel anvils. By simply placing chassis pan on the fixture and locating each anvil on the center pin, parts are quickly assembled. Wiring sample components to anvil holder posts reduces employee training time



Pilot pins projecting above the chassis indicate eyelet positions; these are then centered by table pin in fixture bushing under each anvil, hence cocked eyelets are eliminated. When all pilot pins are encircled by eyelet heads, assembly is complete

ASSEMBLY FIXTURE MAKES

A departure from previous practice, rehandling is eliminated as components are pre-assembled rather than individually located and fastened. Mechanical holding improves product quality



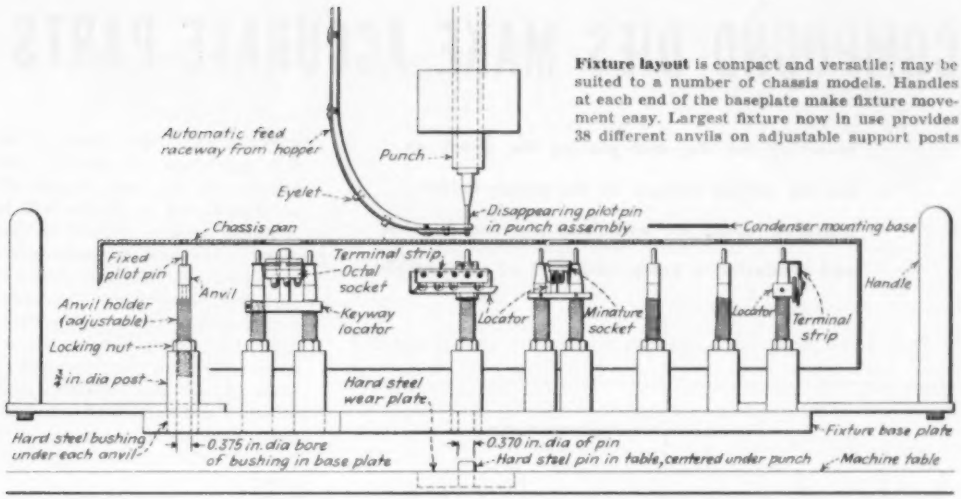
Hardened steel bushing of 0.375-in. ID is located directly below each anvil holder. Positioning this bushing over the 0.370-in.-dia steel pin accurately centers the eyeletting anvil under the punch. Special 24x36-in. table was installed on these machines to accommodate fixturized assembly, center of table contains a hardened steel wearplate inset which carries the locating pin

ASSEMBLY fixtures having pilot-pin anvils at each eyelet position provide accurate and rapid fabrication of sockets, terminal strips, and similar components for television and radio chassis pans.

Fixtures are provided to suit the various chassis designs: Each one consists of an aluminum baseplate with a vertical handle mounted at each end. The ¾-in.-dia vertical hollow posts are located at each position where an eyelet (hollow rivet) is to be driven in the appropriate chassis assembly. Adjustable anvil holders carrying hardened tool steel anvils with fixed pilot pins are threaded into the hollow posts. All anvils can be adjusted vertically to support the chassis pan in a level position when it is placed over the various components mounted on the anvils.

As anvils are mounted only where eyeletting operations are required, the operator need only move the fixture about from bushing to bushing to center, successively, each pilot pin which extends above the chassis pan. All other holes are ignored.

Where two or more sizes of eyelet are required in a given chassis assembly, a different machine is used



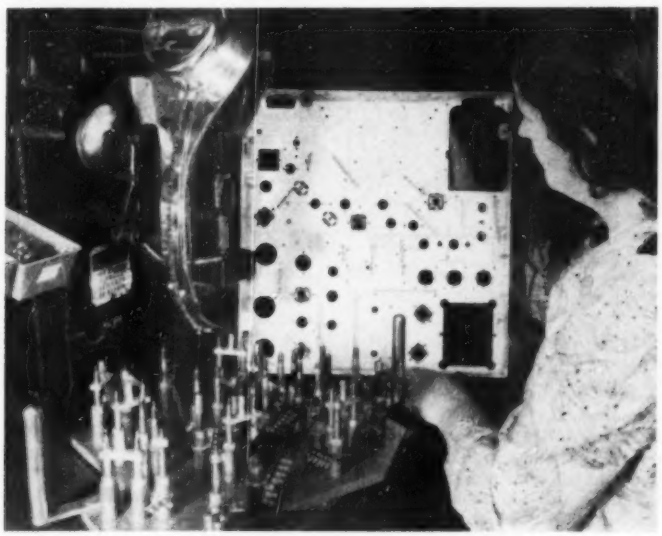
Fixture layout is compact and versatile; may be suited to a number of chassis models. Handles at each end of the baseplate make fixture movement easy. Largest fixture now in use provides 38 different anvils on adjustable support posts

FASTENING FASTER

BY HENRY GILLIG, Plant Manager, Electric Division, STEWART-WARNER CORPORATION

for each size. Jigs are arranged to suit the work to be done at each machine. One jig may be used, in some cases, for a variety of chassis models, anvil holders being added or removed as required. An anvil assembly is provided for each eyelet necessary to mount a given component.

Eyelets, of the various sizes necessary for the parts to be assembled, are provided in pans adjacent to the machine. As a pan is emptied it may be replaced with a full pan and taken to the stock room for refilling. Machine hoppers are filled from the pan. Fewer eyelets are wasted by this method.

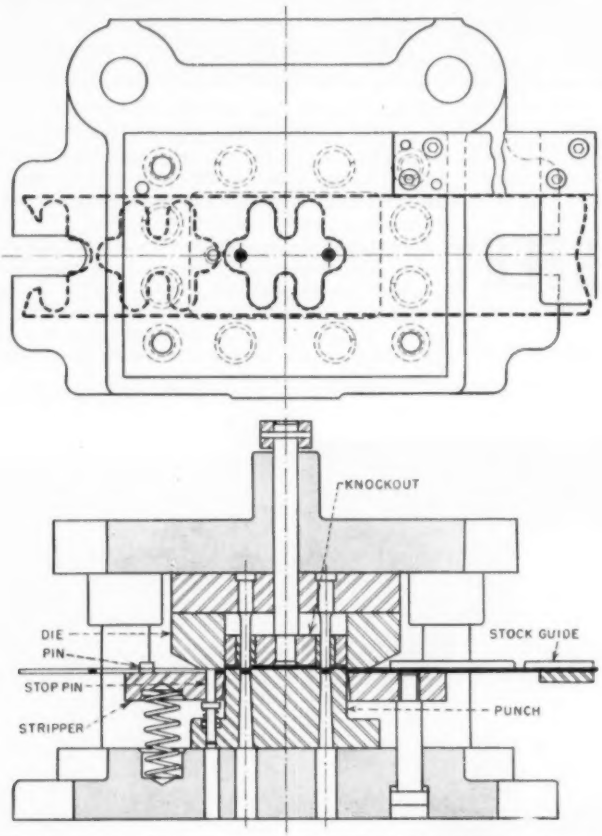


Quality inspection of chassis underside is accomplished when assembly is complete. Fixture is pulled forward to provide easy loading and unloading. Operator is relieved of much of the usual responsibility by mechanical positioning and holding. Production increases are achieved by eliminating individual positioning

COMPOUND DIES MAKE ACCURATE PARTS

Inverting the die, and placing the punch on the die holder instead of the punch holder, provides means for attaching piercing punches and producing a completed part at each stroke

BY J. R. PAQUIN, TOOL ENGINEER, TORRINGTON MFG. COMPANY



Typical compound die produces small part with two holes. In descent, upper die blanks part, then carries it upward for ejection by the knockout. Piercing punches are guided by bushings in the knockout. Material strip is removed from the blanking punch by the spring stripper plate and positioned for next cut by the stop pin. Small compound dies of this type are generally run in inclined presses

COMPOUND DIES combine the operations of piercing and blanking in the same station. All parts produced in the die will be identical, unlike progressive dies where clearances between pilots and part holes introduce errors in piece-part dimensions. Compound dies, therefore, are indispensable in production of components for instruments, office machines, and all other mechanisms requiring great accuracy and flatness of individual parts. Such accuracy prevents serious accumulations of tolerance errors.

These piece-part conditions dictate the use of compound dies:

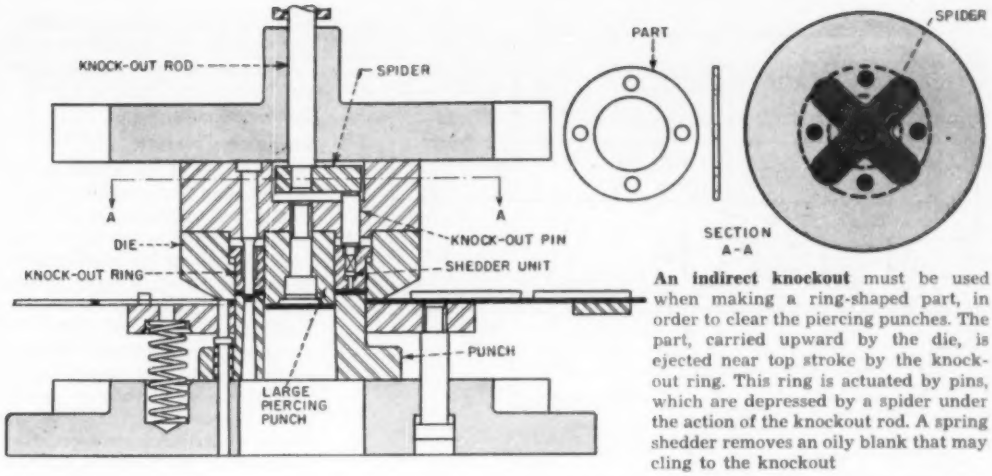
1. Holes that must be held accurately with the outside edges of the blank. In progressive dies, holes are pierced at a station prior to blanking. Pilots locate the strip for blanking. Clearance between the pilots and the holes in the piece-part render improbable the accurate location of the holes in relation to part edges.

2. Blanks that must be flat. The notching cuts taken by progressive dies distort the strip, and perfectly flat piece-parts are the exception rather than the rule.

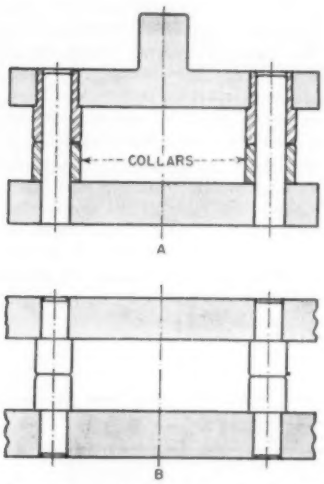
3. Blanks that must have the burnished band on the same side all around the periphery. This condition is necessary when the part will be shaved at a later operation. It is also required for some assembly operations, where pins must enter holes pierced in the part. Such entry should always be from the burnished side of the part. If it is done from the burr side, the operation will be slowed considerably.

4. Blanks too large for progressive dies. Progressive dies are not efficient when large blanks are being run, so the latter are generally produced in compound dies.

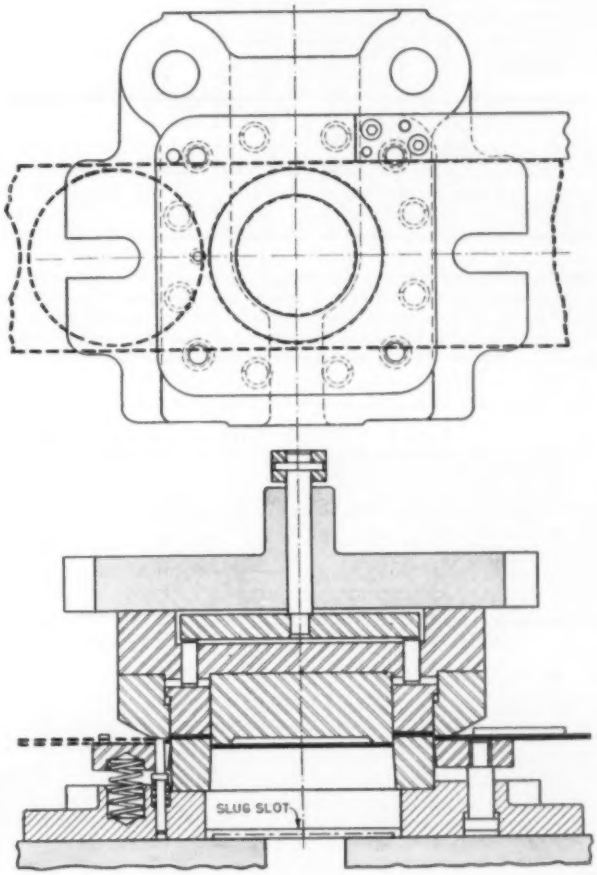
5. Parts that must be produced from waste pieces of metal left from previous operations. Compound dies provide an excellent



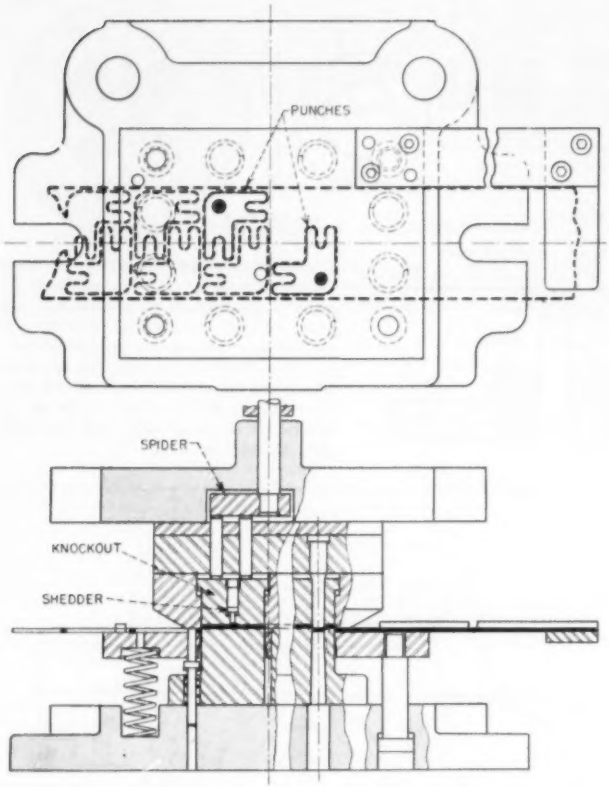
An indirect knockout must be used when making a ring-shaped part, in order to clear the piercing punches. The part, carried upward by the die, is ejected near top stroke by the knockout ring. This ring is actuated by pins, which are depressed by a spider under the action of the knockout rod. A spring shedder removes an oily blank that may cling to the knockout



Damage to indirect knockouts by lowering the ram too far, or in die storage, is prevented in two ways: View *A*—in operation, die is set so shoulder bushings come within 1/32 in.; View *B*—In both die halves, posts are pressed to limit travel of upper member



A slug slot must be machined in the die holder, if the bolster hole is too small, or a large one would weaken the press. The slug drops into the opening provided and out the back if the press is inclined. Maximum support to the front of the die is retained by machining slot to dotted outline shown in plan view



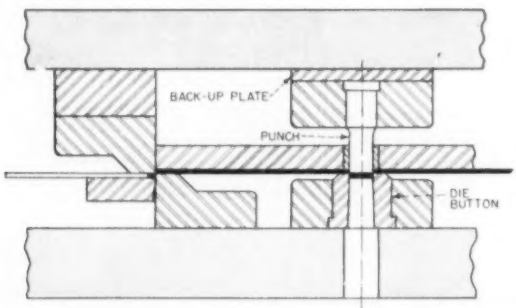
Double compound dies are expensive to build, but are warranted on high-production jobs, where the blank must be flat. Two identical punches are located on the lower member. Blanks are released from the upper die units by knockouts actuated through pins by a common spider. A shedder unit in each knockout peels away the blanks

means of using up scrap. Considerable savings are effected by using compound dies for this purpose.

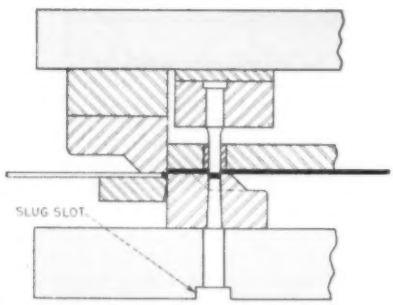
Center of Stripping Pressure

The center of the knockout rod in compound dies must be so placed that it is at the center of stripping pressure. If rod is not in the center, the greater pressure against it on one side will create binding, and it will probably bend. For symmetrical dies, the center of stripping pressure is at the center of the die opening. However, for irregular parts with holes placed at unsymmetrical positions, the center of stripping pressure must be found by the following method:

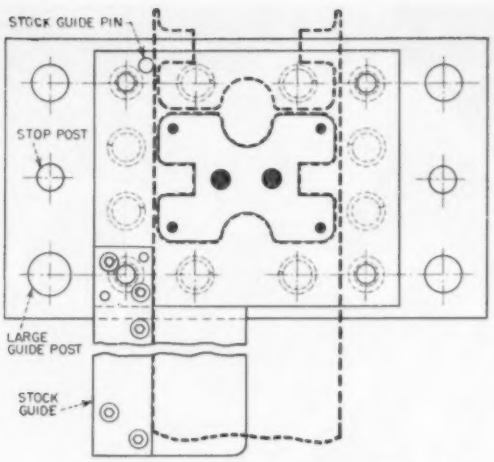
The blank outline is drawn on heavy cardboard and the holes marked with pencil. The outside edge is then cut with shears, and plugs are cut from cardboard of the same thickness. These plugs are made the same size and shape as the holes in the part. They are then glued to the face of the cardboard part at the position that the holes will occupy. This unit is then balanced on a pencil point (plugs up), until the center of balance is found. This point is marked and measured. It is the center of cutting pressure. The center of the knockout rod must be placed at this point.



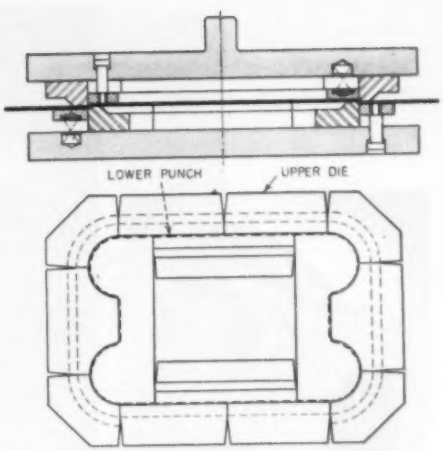
Piercing-punch units like this can be used in large sectional dies, if the holes are some distance from the edge of the part. The hardened die button is retained by a plate fastened to the die holder with screws and dowels



Die hole is machined in segment of lower punch, if hole must be pierced close to part edge. Punch segment is widened to suit. Slug slot is required, because it is unlikely that bolster opening will be directly below



Large compound dies are generally set up in straight-side presses, and the stock guide is moved to lower left for front-to-back feeding. To avoid accidental reversal of the punch holder, one guide post is made oversize. Travel of the upper die is limited by incorporation of shouldered stop posts in both members



Sectional construction is used for large compound dies, such as those employed for making cabinet and electric-stove panels. Four sections comprise the lower punch; ten sections the upper die. Two spring strippers are incorporated. One strips the blank, the other the material strip from the lower punch

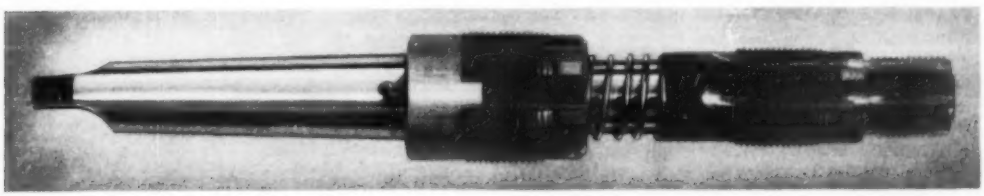
Distance Between Edges of Holes and Edge of Part

If an attempt is made in a compound die to pierce holes located too close to the edge of the part, or too close together, a weak section will exist in the lower punch. This would soon crumble. A widely followed rule is: Minimum distance between the edge of a hole and the edge of the part, or between the edges of adjacent holes, is one thickness of stock. For thin stock, and when the frail section would extend for a considerable distance, this dimension must be made greater.

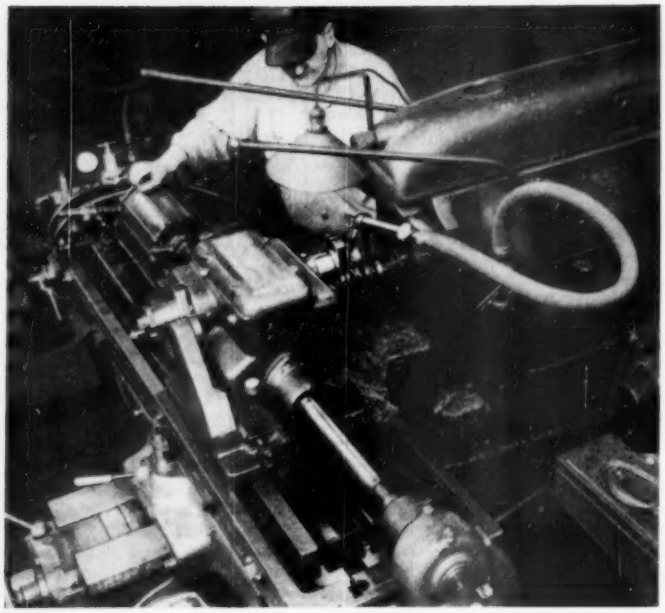
When a compound die cannot be used because of unsatisfactory part conditions, progressive operation must be considered. If accuracy requirements prohibit use of a progressive die, the part must be blanked in a regular blanking die, and the holes pierced in another die at a sacrifice in output.

TANDEM TAP COSTS MORE—JOB COSTS LESS

THREE DIAMETERS and two leads are tapped with this single tool. It taps 1⅛- and 1⅜-in. 12N holes in line, and also a 1½-in., 11½ straight pipe thread in the outer wall of the same casting for a St. Louis pump builder. The original request was for roughing and finishing tandem taps to handle the 12-thread holes. The counter proposal, by engineers of Greenfield Tap & Die Corp., was for this single tap to complete the tapping in one operation, and with a floating shell tap for a third thread of longer lead they'd noticed on the same axis. The two smaller, solid taps engage first, then the third section begins its cut, splining allowing it to creep forward against a spring as tapping progresses.



One cam surface controls valve action when engine goes forward, other controls during reverse. The blended surface between them is the critical job



OLD SETUP was on milling machine with mechanical attachment, a series of master cams, and a number of special cutters and gears

METHOD SHIFT SAVES WORK SHIFT

Halving machining time was one benefit when a milling job for diesel engines was modernized. The changeover also reduced labor costs, tooling costs, and cut out expensive hand operations

BY J. F. STEVENSON, Asst. Works Manager, COOPER-BESSEMER CORP., GROVE CITY, PA.

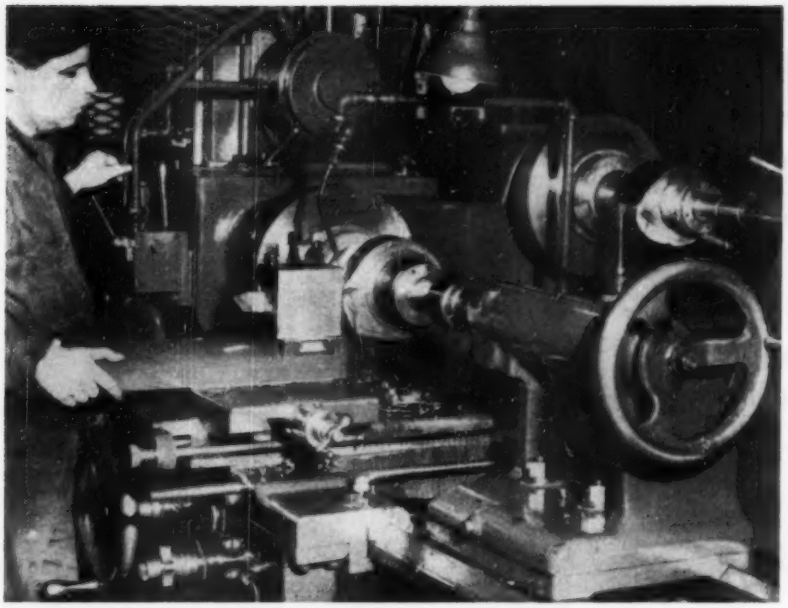
DIRECT-REVERSING diesel engines employ a sliding camshaft with inlet and outlet cams that have separate surfaces for forward and reverse rotation. The cam surfaces themselves are only an average contour-machining job, but the blended surfaces between them are not. These uneven areas between the ends of the cams must be cut so they prevent power operation of the engine when it is being shifted and so they allow valve-lift rollers to slide freely from cam to cam.

Originally the machining was done on a mill with extensive tooling. The cams were cut from forgings in a complicated setup; and even then some hand-blending was required before the surfaces were smooth enough to pass inspection.

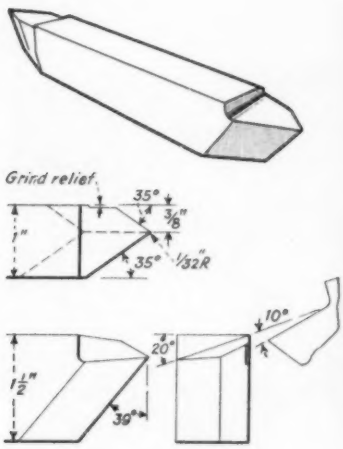
With the turning setup, cams are cut from bar stock with feeds as high as 1/32 in. per rev and as deep as ½ in. The lathe has two spindles; one carrying a master cam and the other rotating the work at the same rpm as the cam spindle. A single-point, special-shape toolbit is carried in a heavy toolholder block. Spindle rpm varies according to the movement of the tracer finger, which results in constant surface speed at the cutting edge.

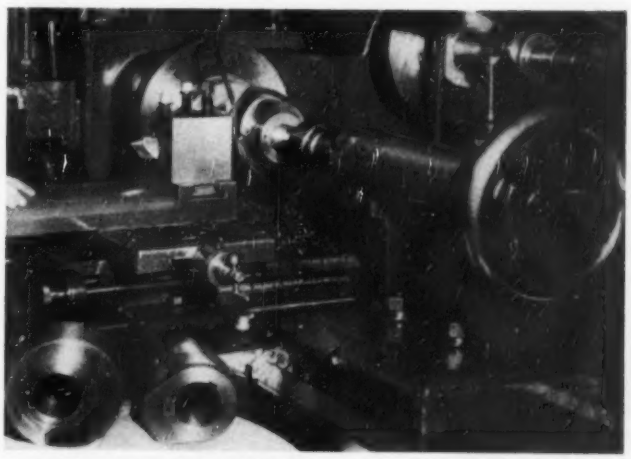
The new cams are not exact duplicates of the old ones made with cruder methods. The switch enabled Cooper-Bessemer engineers to design a better cam that followed ideal control shapes much closer than the old one. Higher production rates are partly inherent advantages of the new machine, partly a function of the constant-surface-speed idea (which makes the new cutting speed higher than the old average speed), and partly the elimination of time-consuming hand finishing operations.

The result: one hour and 42 minutes saved in machining time on each cam.



NEW SETUP is on Cincinnati profiling lathe with hydraulic master-cam follower and a constant-surface-speed hydraulic spindle drive





New tooling is one, single-point bit, directed by tracer on rear master-cam spindle which shifts toolslide to cut engine cam from bar stock (lower left)

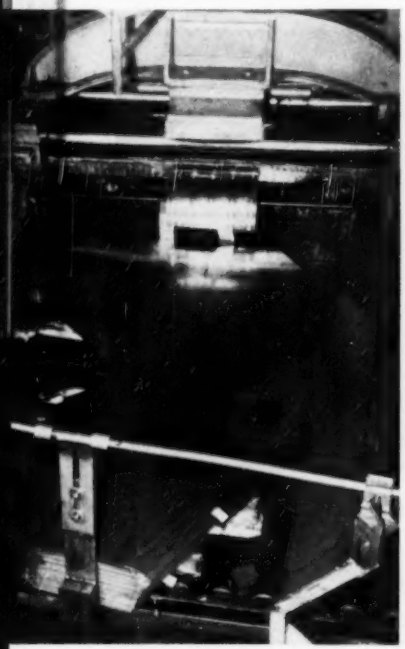
Discarded special cutters, mills, cams, gears, and indicator were scrapped after new equipment started doubling production

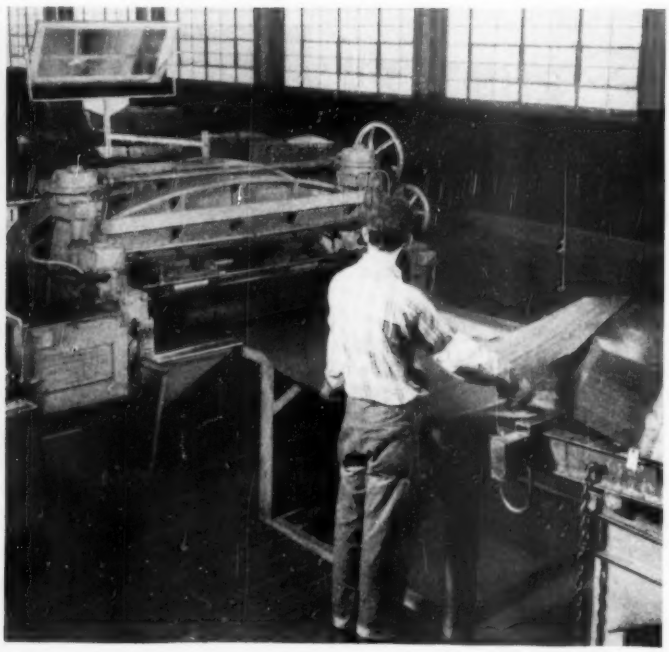
SHOP SHOTS

at

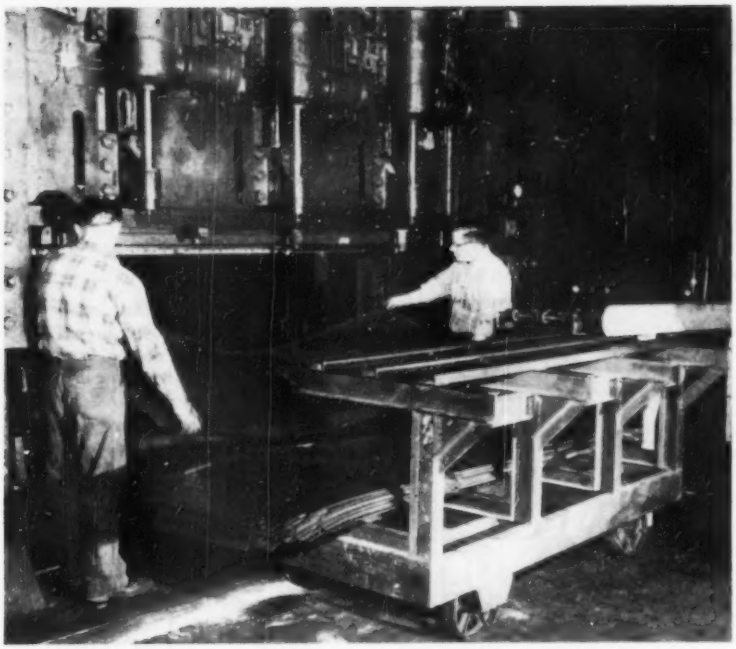
CURTISS-WRIGHT • CHEVROLET
B&M MFG. CO. • HOTPOINT, INC.
WESTINGHOUSE

F-84 elevator stiffeners are heat-treated in strips, before they are cut apart, but they warp when handled flat. Bending them into polygon form, then stacking, prevents twisting. After treatment, they are straightened in a drop hammer. *Curtiss-Wright*





Stacking fixture behind roller-leveler press catches front auto-fender blanks and lines them up for easy removal. Any blanks can be handled because stacker is adjustable. Mirror lets operator check stack visually from time to time. *Chevrolet*

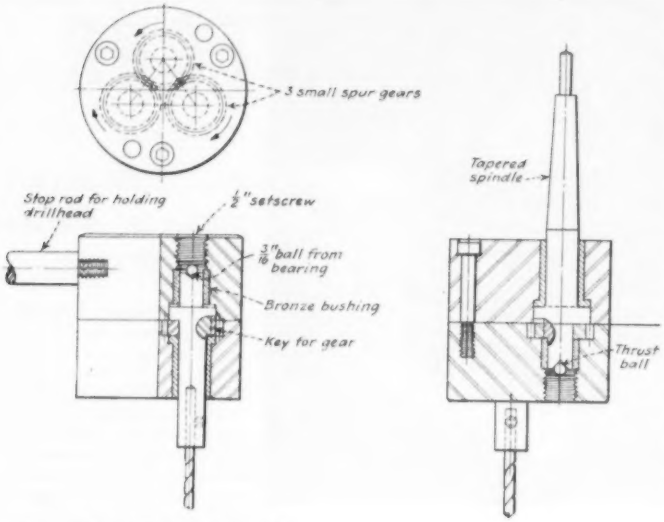


Two-level trucks move flat stock to press line where metal cabinets are formed. Truck can be located so it is part of conveyor system; sheets are lifted to press, formed, then dropped on upper level and pushed off end onto roller conveyor to next operation. *Hotpoint.*

Swiveling jib crane serves nine assembly stations where equipment is loaded on truck skids. Idea saves space, interference, and use of more than one hoist. Skids allow removing finished assemblies quickly. *Westinghouse Electric*

Heliarc welding machine forces coiled strip into spiraling die and welds it into spiral tubing as it emerges. Stock formed can be steel, stainless, brass, or light metals; and forms tube with diameters from ½ in. to 3 in. *B & M Mfg. Co.*

Practical Ideas



Simple Drillhead Has Ball Thrust Bearings

THIS DRILLHEAD has a minimum of friction and should develop little wear because of two thrust bearings. End pressure is taken up by bearing balls that are seated in the ends of the spindles. These work against setscrews, which can be adjusted so the gearing works smoothly.

Both the driving spindle, which works in the drillpress head and the driven spindle, which chucks the gear, are fitted with bronze bushings, both above and below the gears. The gears are keyed to the spindles.

Power is transmitted from the driving spindle to its gear, then to an idler gear, and finally to the driven gear which turns the drill. There is no end thrust developed in the idler gear, so it is supported by a spindle in bronze bushings, one in each half of the drillhead.

This head was packed with grease and has run for over three months without lubrication or any adjustments. *Kenneth L. Stottenberg, Milford, Mich.*

Colloid Lubricates in Heat and Degreaser

THE PROBLEM of lubricating a long conveyor system through degreasing and drying cycles defies ordinary petroleum products. One plant in Philadelphia has a 700-ft monorail conveyor which goes through degreasing, washing, drying, prime paint coat, drying, final paint coat, and final drying. The regular lubricant gummed up at high temperature and broke down at the degreasing stage.

A switch in lubricant was made to a colloidal-graphite suspension in paint thinner. This is mixed in the shop. The solid lubricant is chemically inert and therefore impervious to degreasing. It is also unaffected by heat up to 5000 F in inert atmospheres.

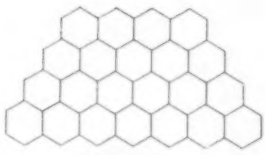
The lubricant is applied to the conveyor for 1½ hr per week through two guns mounted 6 in. from the edge of the chain. This provided freedom of motion for the full length of the conveyor system. *Acheson Colloids, Port Huron, Mich.*

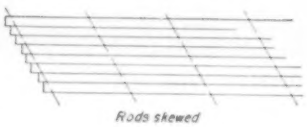
Water Glass Makes A Fixture

HEXAGONAL duralumin stock had to be cut off at the ends to exactly a given angle. While the work did not justify much tooling, it was not being done accurately by conventional methods.

By gluing the rods together, a hundred at a time, a lot of scrap was saved, and the cutting operation was made easier and more accurate. First a batch of 100 was stacked and slanted so the 3/32-in., 6-in.-long rods were aligned at approximately the right angle. Then they were wired together and immersed in a sodium-silicate solution (water glass). When dried, the stack was stripped of the wire and placed in a miter box to be sawed off at the given angle.

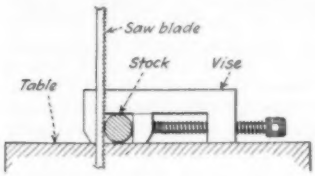
A hundred could be handled as a single piece this way, so production was rapid. After the cuts were made, soaking the stack in hot water released the pieces. *Chester S. Ricker, Detroit, Mich.*





Inverted Vise Holds Bars For Cutoff in Bandsaw

ROUND STOCK being cut on a bandsaw often turns under the saw and is difficult to hold in a vise. One way of gripping the work better



is to turn the vise over and shim up the stock so it comes down even with the tops of the vise jaws.

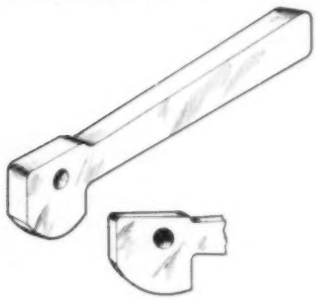
This means that both jaws of the vise and the edge of the stock will bear on the table. The stock itself will be held firmly in the vise by means of the two jaws and the shims. *Einar L. Westdal, Bloomfield, Conn.*

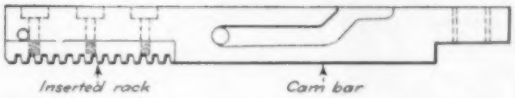
Cast-Iron Clamps Cut Fixture Costs

FIXTURES COSTS can be considerably reduced by casting quick-acting cam clamps in gray iron. We make them at a cost of about 15 cents each.

Two small indentations on each cam are cast that way to locate the drill when the clamp is being machined to fit a fixture. Drilling the center hole is the only machining that is required. The clamps are designed so thick handles will provide adequate strength.

We have found this kind of clamp to be economical, and easy to replace when worn out. *W. A. Court, Memphis, Tenn.*



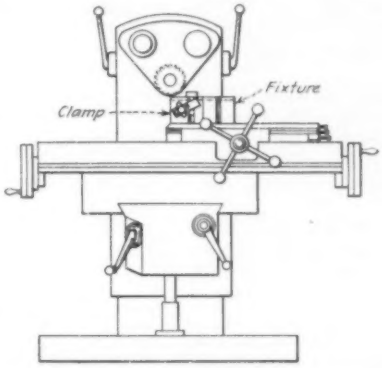


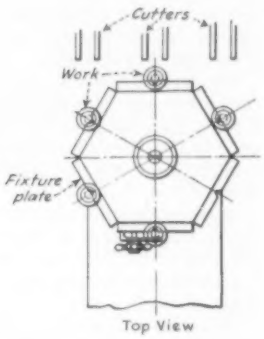
Cam-Bar Replacements Are Inserted for Economy

ON A TOUGH LATHE JOB where we were turning forged parts we had a lot of trouble with the clamp bars on our automatic screw machines. The teeth in the rack section would continually strip out. New cam bars are expensive and repairing the old ones by building up with welding and rehobbing took too long.

What we did was to make up a quantity of rack inserts which could be fitted to the cam bars as they broke. A stripped cam bar was milled out, then drilled and tapped, and the rack was inserted.

The inserted racks broke, too, but they were simple to replace. Inserts were made of tool steel, hardened for toughness. They take the pounding better and last longer than the original bars. *Frank M. Butrick, Jr., Alma, Mich.*



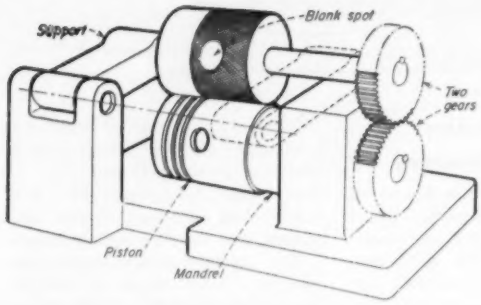


Indexing Head Locates Screws For Gang-Milling

TO SPEED UP the production of a milling machine to mill hex heads on brass screws, it was decided to use an indexing fixture which would complete one screw at each pass, using a gang of six cutters. The cutters were spaced so each double set milled opposite sides of a screw head. The problem was to produce a quick-indexing fixture that would allow high production.

We took an old self-locking lathe turret and clamped it on the milling-machine table with the indexing wheel overhanging. A small plate was screwed to each face of the turret, and a V-groove was milled vertically in the center of each plate. These grooves were to locate the screws. Clamping was done by small straps that were attached to the plates.

The round heads of the six screws, when clamped in place, projected above the turret so the ganged cutters would cut off two faces on each of the six screws in each pass of the table. When starting up the run, two partially finished screws were removed from the setup after each of the first two passes and new stock was put in. This made production continuous so that after each pass two finished screws were removed, two new screws were put in place, the turret was indexed, and then another pass was made. *Allan Clarke, Rochdale, England.*



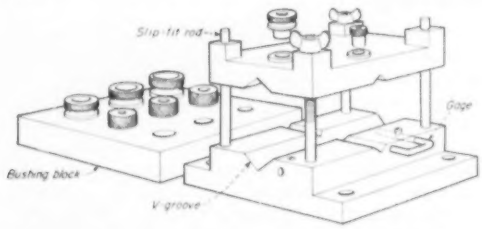
Geared Mandrel Does Match-Knurling Job

TO KEEP the knurl on aluminum-alloy pistons from overlapping anywhere around the skirt, and to omit knurling at the piston-boss area, Cummins engine employs a knurling tool that utilizes a roll of the same size as the piston.

Pistons are finished off slightly undersize. Then they are mounted on a mandrel that meshes through a set of equal gears with the knurl arbor. The gear ratio is 1 to 1, so the diamond-shape pattern has to come out even after a rotation, and the pattern cannot overlap.

Because the knurling tool is the same size as the work, a blank spot on the tool can be left to pass over the piston-boss area. The gearing assures that the blank will not run over the work at any other spot.

Knurling is done at a pressure of 7000 lb, exerted by hydraulics. The knurling measures about ⅛ in. from point to point, with grooves about 0.010 in. wide and 0.005 in. deep. *Chester S. Ricker, Detroit, Mich.*



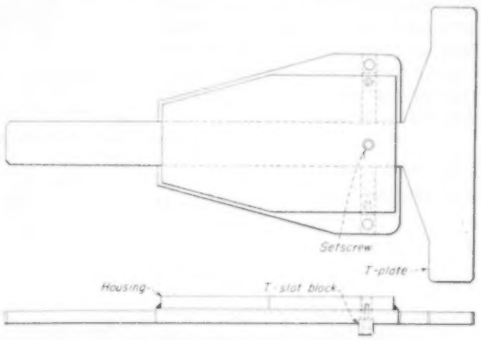
Drill Fixture Locates Work

THIS JIG should save hundreds of manhours because it has an important feature—it has two master drill-jig holes, located exactly 1 in. and ½ in. respectively from the edges of the block. This eliminates a great deal of layout work, and often eliminates centerpunching because the work can be located accurately under drill bushings.

Two matching V-blocks are made—one has an extra flange and holes drilled so it can be bolted down on a table. Holes for alignment and clamping rods are carefully drilled. Two of these in the upper block are slip-fits for the rods, while the other two are clearance holes for the two threaded rods. Clamping is done with two opposite wingnuts.

Two V's are machined in both blocks, with one smaller than the other and exactly at right angles to it. One drill-bushing hole is located exactly over the smaller V and precisely ½ in. from the edge of the block. The other is over the larger V, and is 1 in. from the edge of the block. A hole is drilled into the lower block parallel and close to each V-notch to take a bent sliding gage, which will locate stock endwise in the V's. The gage is held by a setscrew over each hole.

Accessory drill bushings are held in a wooden block mounted to the rear of the fixture. This block need not be attached to the fixture, of course. The bushings are turned from cold-rolled steel and carburized. *Herman D. Stewart, Alameda, Calif.*



Adjustable Stock Guide Improves Shear-Blade Wear

BLADES on our 12-ft, ½-in. capacity shear were wearing out rapidly, and the wear always occurred at the same place—near the regular stock guide where the shear blade hit the work first. We decided to try an adjustable guide with which we could shift the location of work occasionally to make the shear blade contact at different points.

The guide is a simple weldment, made up of a housing and a T-plate—much like a T-square. The housing is three plates of hardened steel, about 1 in. thick, and welded together to form a channel. The channel is milled after welding to make its width accurate and to finish the edges and surfaces against which the T-plate bears. The T-plate is a flame-cut piece of ⅞-in. stock, machined after it is cut to parallel edges.

Two holes through the housing allow bolting the guide down on the table. Minor location adjustments are made by shifting the T and locking it with a setscrew through the top of the housing. Two small blocks located in a keyway that runs at right angles

to the main slot allow shifting the whole unit to another table slot, to be held there temporarily.

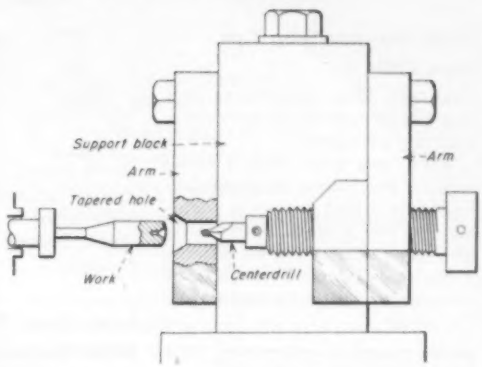
The device not only saves blade wear, but also permits the operator to shift the work to any convenient position, thus saving fatigue *H. G. Frommer, Milwaukee, Wis.*

Bell-Mouth Fixture Holds Stock for Centerdrill

AFTER COMPETING a fairly large batch of job-lot parts, an unexpected change in design called for them to be centered and ground. Individual chucking would have been quite expensive, and gripping the parts in the collet would not have been very accurate. Fortunately, the ends of each piece had been radiused, which allowed us to use an unusual attachment.

First a mild-steel plate was bolted to the lathe saddle. This carried two strong arms which extended to the center of the lathe. A hole along the centerline of the lathe was drilled through the front arm, and then the front end of the hole was tapered. This allowed chucking each workpiece very lightly at the end, and moving up the saddle so the tapered hole would center each workpiece.

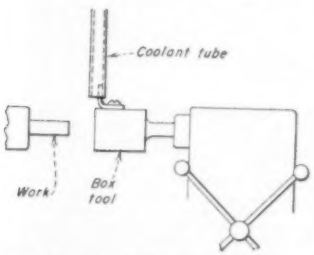
The rear arm was fitted with a heavy block and screw that carried a conventional centerdrill. The hole in the arm was drilled through at the same time



that the hole in the front arm was drilled so both would be on the centerline of the lathe.

After a workpiece is chucked, the saddle is moved up until the bell mouth in the front arm centers the end of the work and holds it steady as it rotates. Then the centerdrill is moved up by turning the supporting screw through the rear arm. While this is going on, light pressure on the saddle-traversing wheel will hold the workpiece in position.

With this method, a heavy tailstock does not have to be utilized. Workpieces with square or hex ends can be handled, as well as round stock. *Ian J. Peacock, Cumberland, England.*



Guided Oil Tube Keeps Coolant on Tool

WHEN USING a box tool on a screw machine it is essential that coolant hits the cutting edges of the tool at all times. But with the tool oscillating back and forth, it is almost impossible to direct the stream so it will flow on the tool all the time. Flooding the work is not always the best way to cool it.

We attached a stiff wire to the box tool with a machine screw, bent it up vertical, and slipped the coolant tube over it and pushed the tube down close to the tool. The oil stream now follows all motions of the tool and falls on the cutting edge. *F. A. Adams, Dayton, O.*

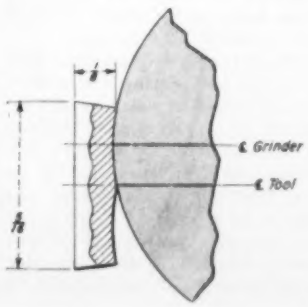
Carbides Concave-Ground For Cutting Cast Iron

AFTER RUNNING a battery of Sunderland lathes for nearly two years with round carbide inserted tools on gray-iron clutch castings, we started to develop chatter in the operation which ruined the finish on many of the plates. The condition was evidently caused by a minor change in the composition of the iron, which we could not control, so we were forced to alter the tooling slightly.

After some experimenting, we found that the illustrated toolbit profile worked quite well, causing only minor chattering on less than 10% of the work. Until we found this tool angle, we were losing 85% of the castings because of chatter.

The toolbit is shown in a horizontal position, against the grinding wheel—a thin one. Diameter was 4½ to 6 in., which formed a concave surface on the top of the bit as the tool was plunged and rotated. In effect, this gave us a positive rake angle. The angle ground on the outside edge of the tool, which was the clearance angle, was about 8°.

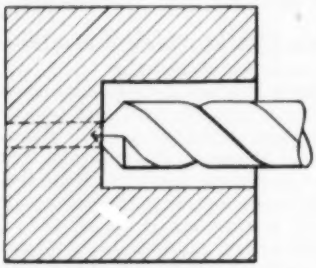
We managed to get 700-750 pieces per tool regrind with this tooling, and met our finish requirements of 80-120 micro-inches, rms. *Frank M. Butrick, Jr., Alma, Mich.*



Three Machine-Shop Tips From Chile

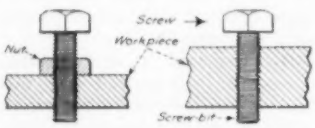
HERE ARE three suggestions that may not be new to all old-timers, but they are useful:

When you must drill a small hole at the bottom of a cavity—especially a long one—it is necessary to use a small, weak drill. This may wobble if no centerdrilled hole is cut; but it may be impossible to get a centerdrill into the cavity.



Take a large, stout drill, center the work accurately, and drill a cone in which the small drill will start easily and will be guided on center.

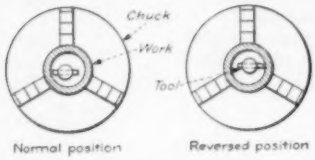
When it is necessary to fasten a screw so it cannot loosen under vibration, a secondary nut under the head will jam the threads to hold the screw firmly. But often a second nut cannot be installed.



A good substitute is to thread a headless screw into the hole first; then thread in the screw so it will jam inside the tapped hole.

When boring a small, deep hole on a lathe, a boring tool almost always has a tendency to chatter, which produces a poor surface. You can decrease the cutting speed, reduce the feed rate, ease up on the depth of cut, or clamp the tool more rigidly.

Changing the position of the boring tool 180° so the sharp edge is down almost always reduces the



chatter—probably because in this position the tool support is more elastic. *Federico Strasser, Santiago de Chile.*

Press Brake Rivets With Temporary Blocks

RIVETING is done so seldom in our shop that special equipment is impractical. However, the hand method of flattening rivets is slow and tedious. We have discovered a good technique where we can use a press brake to do the riveting.

We made two blocks of hardened steel which were 2x4x12 in. One was fitted to the brake in place of the normal blade, and the other was installed directly under the first and was held on the bed by a mitered tongue. A piece of 4x4x¼-in. sponge rubber was fastened with cellulose tape to the center of the lower block.

The operator inserts the rivet through the holes in the two parts to be assembled, places the assembly down on the rubber-faced block, and steps on the pedal.

With this method, about 135 pieces can be finished in an hour instead of the usual eight hours by hand methods. *M. E. Frazee, American Wheelabrator & Equip. Corp., South Bend, Ind.*

$25 *In addition to regular payment*

for the best

PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

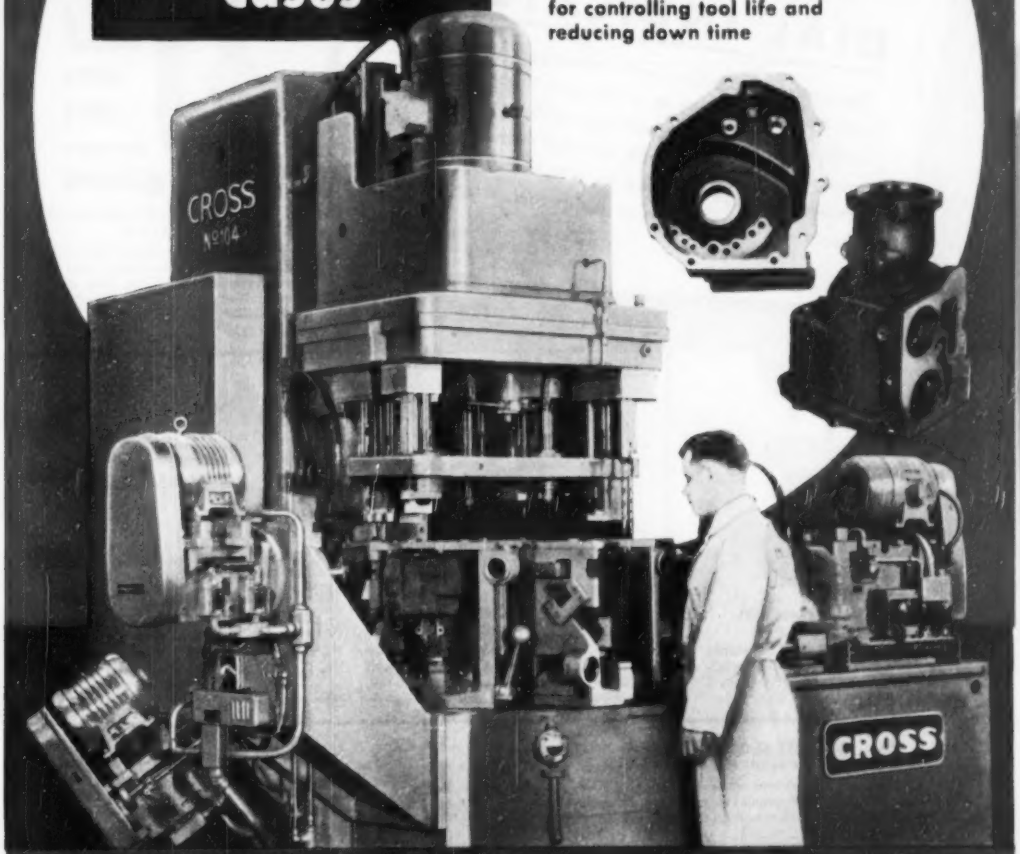
HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

106th Winner:
Peter Lashta
Curling Tool

Another Special by Cross

Drills, Reams *Automatic* Transmission Cases

- ★ 85 pieces per hour at 100% efficiency
- ★ 29 drilling, reaming, and spot-facing operations
- ★ Automatic lubrication
- ★ 5-station, power driven index table
- ★ J. I. C. standard hydraulic and electric installations
- ★ Toolometers and pre-set tools for controlling tool life and reducing down time



CROSS

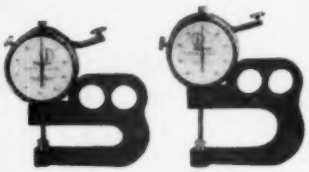
Special MACHINE TOOLS

NEW!

Starrett

DIAL INDICATORS

These new Starrett Dial Indicators bring you dependable Starrett accuracy in a new and highly versatile form. Designed for the widest possible application to production inspection with new and exclusive Starrett features, you can count on them to bring greater efficiency and economy to your quality control operations.



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½" and 1" thickness capacities; 2½" throat. Available with direct reading or balanced dial indicators. Also with special sizes and shapes of anvils.

"LAST WORD" TEST INDICATOR No. 711-E

With universal friction holder and universal shank for infinite adaptability. Also features reversible action and hard chrome plated contact point with ratchet joint. Graduated .001", reading 0-15-0, range .030".

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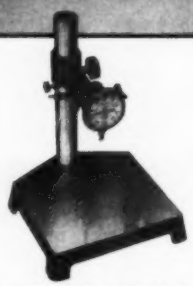
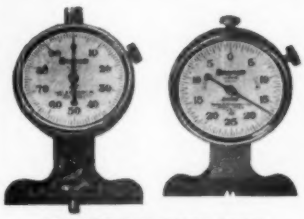
With sliding table and fine adjustment. Vertical capacity 1¾". Throat depth 1⅛". Indicator graduated .0005", reading 0-25-0, range .125".



STARRETT DIAL COMPARATOR No. 653

With fine vertical adjustment. Base platen 9" x 9⅝". Vertical capacity 9¼". Throat depth 5". Indicator graduated .001", reading 0-50-0, range .250".



STARRETT DIAL DEPTH GAGES

No. 644 with flat base and 11 extra rods; capacity 0-3 inches; indicator graduated .001", reading 0-100, range .250". No. 643 with knife-edge base and push-down needle point, indicator graduated .0005", reading 0-25-0, range .125".

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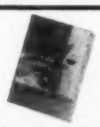
Make all your indicators shockless at low cost. New shock absorbing point with internal spring effectively cushions impact. Standard No. 4-48 thread fits all A.G.D. indicators.



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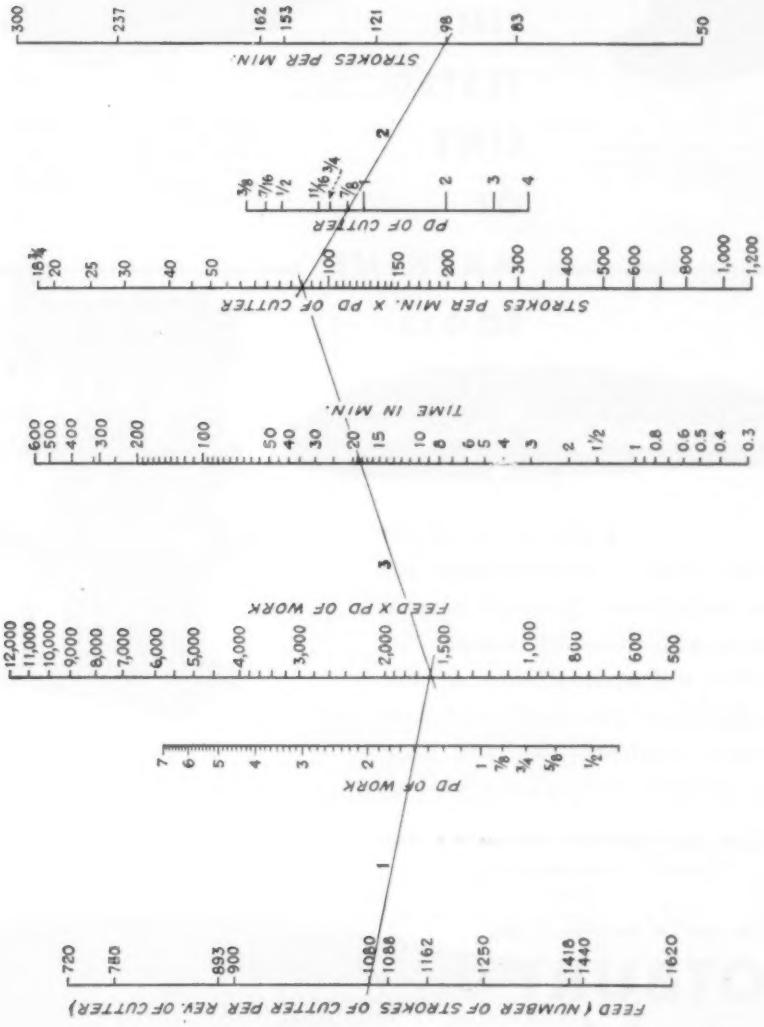
Estimating Production of Gear Shapers

BY JAMES W. DUFFY,
Gear Specialist, Locomotive Parts Dept.,
Allison Div., GENERAL MOTORS CORP.

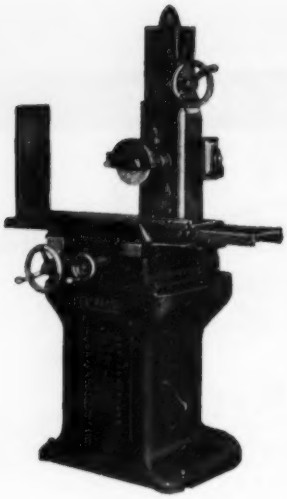


Time in min. = $\frac{\text{Feed} \times \text{PD of Work}}{\text{Strokes per Min.} \times \text{PD of Cutter}}$

Example:

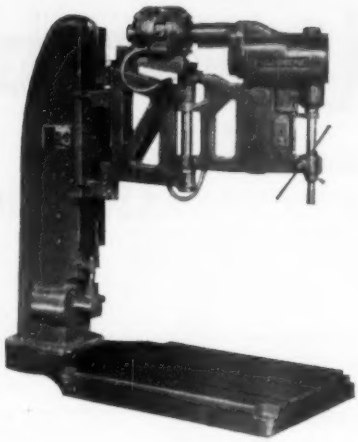
Given a gear with a 1½ in. PD, a 1080 feed (or number of strokes of cutter per revolution of cutter), 98 strokes per min. and ⅝ in. PD of cutter.

1. Connect 1080 feed and 1½ in. work PD and obtain approximately 1620, as the reading on the feed × PD of work scale.
2. Connect 98 strokes and ⅝ in. PD of cutter and obtain approximately 85, on the strokes per min. × PD of cutter scale.
3. Join 1620 and 85, read the cutting time as 18.9 min. on the intervening scale.



A very accurate 6" x 18" Hand Feed Surface Grinder especially adaptable for Tool Room Work and work on small, fussy pieces.

A TIME TESTED LINE OF MACHINE TOOLS



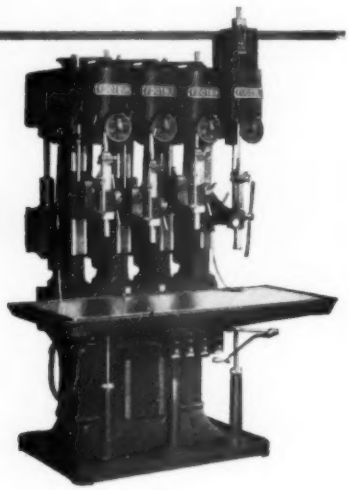
A Unique Radial Drilling Machine with Hinged Bracket that makes it possible to swing quickly from hole to hole over a wide area. A very convenient tapping arrangement is incorporated in this machine.

Engineered for Production

● The choice of fine machine tools is an investment for future profits when products have to be made with increased accuracy and efficiency. ● These machines are built with the usual Footburt workmanship and sturdiness that will keep them accurate over a long period.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building



Built in 1, 2, 3, 4 and 6 spindle models, also as a tool room drilling machine, these sensitive drilling machines are accurate for the most exacting work and have the usual Footburt sturdiness of construction to make them suitable for continuous production line work. The above 4 spindle machine has tapping attachment and power feed attachment.

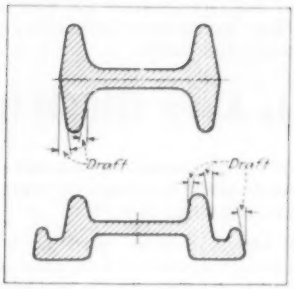
● A TIME TESTED LINE OF MACHINE TOOLS

FOOTBURT *machine tools*

ENGINEERED FOR PRODUCTION

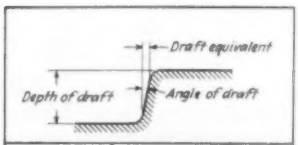
These data are used in the automotive industry. Sources, among others, were: ASM "Forging Handbook", Atlas Drop Forge Co., and Boeing Airplane Co.

DESIGN OF FORGINGS...I



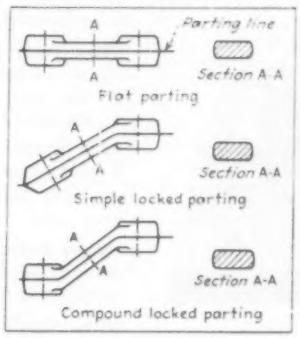
DRAFT

Draft is the angle of taper given side walls of a die impression to permit easy removal of the forging from the drop-forging die. Normal draft for external contours is 7°, for internal contours, 10°. For thin sections and special cases where shrinkage will not wedge the forging into the die, less draft may be used. A press-forging die with mechanical ejector minimizes or avoids need for draft.



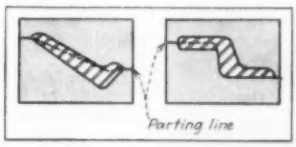
Depth of Draft		Draft Equivalent for Angle of		
		5°	7°	10°
1/32		.0027	.0038	.0055
	1/16	.0055	.0077	.0110
3/32		.0082	.0115	.0165
	1/8	.0109	.0153	.0220
5/32		.0137	.0192	.0276
	3/16	.0164	.0230	.0331
7/32		.0192	.0268	.0386
	1/4	.0219	.0307	.0441
9/32		.0246	.0345	.0496
	5/16	.0273	.0384	.0551
11/32		.0301	.0423	.0606
	3/8	.0328	.0460	.0661
13/32		.0355	.0499	.0716
	7/16	.0383	.0537	.0771
15/32		.0410	.0576	.0827
	1/2	.0438	.0614	.0882
9/16		.0492	.0691	.0992
	5/8	.0547	.0767	.1102
11/16		.0601	.0844	.1212
	3/4	.0656	.0921	.1323
13/16		.0711	.0998	.1433
	7/8	.0766	.1074	.1543
1		.0875	.1228	.1763

Die draft equivalent is the amount of offset that results from applying various angles and depth of draft. Die draft equivalents for 5°, 7° and 10° draft are tabulated for various depths. A 5° draft is usually special.



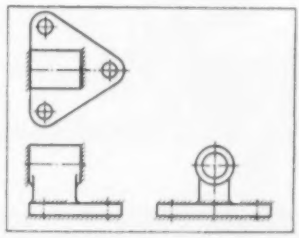
PARTING LINE

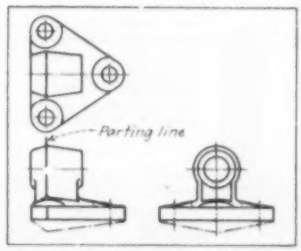
Striking surfaces of dies constitute the parting line. This must be established to determine the amount of draft and its location, and it affects the amount of machining required.

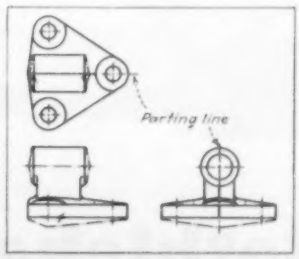


The parting line may be flat, in a single plane, or lock where die faces are in two or more planes. Flat partings are generally most economical. To avoid side thrust on the dies, locate parting lines at right angles to die thrust wherever possible. If this is impossible for complicated shapes, due to irregular parting lines, position of the part may be balanced in the dies to obtain equal angular die thrusts. Or the parting line may have a balancing angle or counterlock added in excess of part requirements.

For example, to produce a skewed channel, the parting line is not normal to the die motion. Angular pressure *A* causes side thrust







LEHIGH H

HIGH-CARBON, HIGH-CHROMIUM TOOL STEEL

For high-production dies

Photos Courtesy: Middlestadt Machine Co., Baltimore, Md.

Here's a tool steel that's engineered for high-production tools and dies. Experienced toolmakers call it the aristocrat among tool steels.

Quick Facts About LEHIGH H

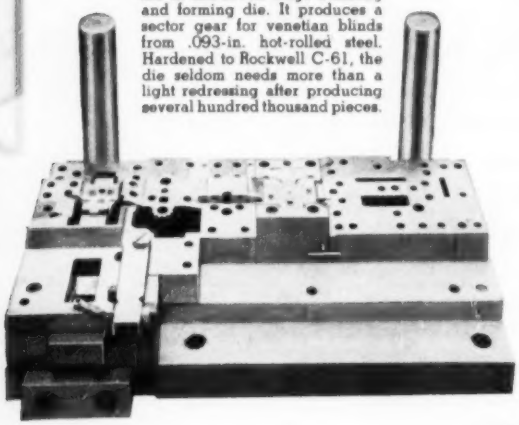
Maximum Wear. Its high-carbon content makes it first choice wherever great resistance to wear is important. Use it for long runs.

Close Tolerances. Lehigh H is the ideal tool steel for maintaining split-hair accuracy. You can count on the very minimum change in size and shape during heat-treatment.

Safe Hardening. Lehigh H is cooled in still air from a hardening temperature of 1850 F. It eliminates cracking hazards for intricate dies, thin sections, short radii.

Heavy Duty. Lehigh H is extremely deep-hardening, even in large sections . . . and has high compressive strength for tools and dies subject to severe service.

Wide Application. Use it for tools and dies that blank, punch, form, draw, shear, and bend . . . for lamination dies, shear blades, wearing plates . . . master gages, bending rolls . . . and the like.



Lehigh H is the key to long die life in this seven-stage blanking and forming die. It produces a sector gear for venetian blinds from .093-in. hot-rolled steel. Hardened to Rockwell C-61, the die seldom needs more than a light redressing after producing several hundred thousand pieces.

Typical Analysis:	C	Cr	V	Mo
	1.55	11.50	0.40	0.80

A trial in your own shop will convince you. Lehigh H is stocked by Bethlehem Tool Steel distributors in principal cities. The nearest Bethlehem sales office can give you full information.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor:
Bethlehem Steel Export Corporation

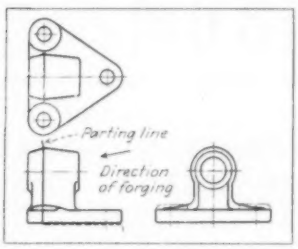
BETHLEHEM STEEL

Bethlehem ULTRASONIC TESTED **Tool Steel**

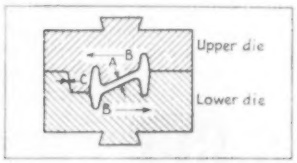
DESIGN OF FORGINGS...II

B, requiring use of compensating lock *C*. Note the increased size of the die block necessary to give strength to the lock.

Several possible locations of the parting line are shown for a simple steel bracket that must have rea-



sonably flat surfaces at locations marked with diagonal lines. In the first case, draft is shown applied to the ends of the boss and top and

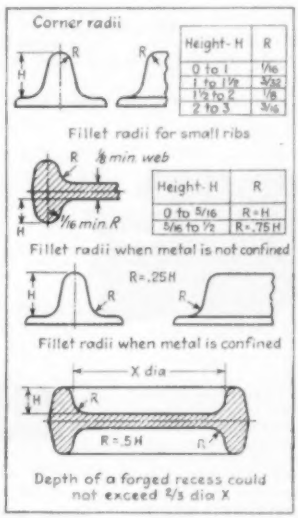


bottom of the base, necessitating machining of these surfaces. In the second case, draft is applied to the sides of the boss, eliminating machining of the faces of the bosses, and to the bottom and top of the base as indicated by dotted lines. Machining must thus be done on the base and around the bolt holes. In the third case, machining is eliminated, except for spotfacing the bolt holes or coining them.

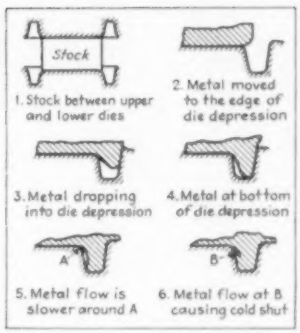
FILLET AND CORNER RADII

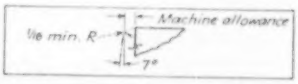
An important matter in forging design is the use of correct radii where two surfaces meet.

Corner and fillet radii on forgings should be as large as possible to assist flow of metal for sound forgings and promote economical manufacture. Stress concentrations due to abrupt changes in section thickness or direction are minimized by fillet and corner radii of the correct size. Any radius larger than recommended will increase die life. Any radius smaller than recommended has a bad effect on die life.



Sharp fillets cause formation of cold shuts, which are laps where two surfaces of metal have folded against each other. This forms a weak spot that may open up as a crack in heat treatment. Cold shuts are most likely to occur at fillets in deep depressions or on deep sections, especially where the metal is confined. In these cases, larger fillet radii are required.


Stock
1. Stock between upper and lower dies
2. Metal moved to the edge of die depression
3. Metal dropping into die depression
4. Metal at bottom of die depression
A
B
5. Metal flow is slower around A
6. Metal flow at B causing cold shut



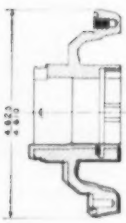
MACHINING ALLOWANCE

When a forging is to be machined, allowance must be made for the material that will be removed. Forging details of normal size in automotive or similar work should provide an allowance for finish of 1/16 in.; for large and intricate forgings, ⅛ in. depending on tooling requirements. If surfaces carry draft, the draft is additional.

The effect of decarburization should also be considered. If the finished piece is required to be hard, sufficient finish should be allowed for removal of the decarburized skin on the forging.

CUT-RATE, sub-standard marginal producers can expect distinguished company — namely the long established reputable manufacturer caught in the squeeze between competitive pricing and high costs. The margins are moving in — but there's room at the center of today's business picture for the manufacturer who takes advantage of the *new* standards of machine tool performance.

NEW BRITAIN
MODEL 675 AUTOMATIC CHUCKING MACHINE



Automotive transmission part, AISI C-1050 drop forged steel, finished in two operations on two New Britain Model 675 Carbide Tooled Chucking Machines. Sixty-five pieces are completed per hour with thirty-five operations performed by the two machines. They include forming, drilling, boring, turning, facing, grooving, trepanning, radius forming, chamfering, recessing and finish reaming. Unusual accuracy is required in maintaining one-thousandth tolerance on the diameters of the two bores and two-thousandths total indicator reading limits of concentricity. Typical of the ability of fully modern New Britains to make profits by making production fast, accurate and automatic.

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

MULTIPLE SPINDLE AUTOMATIC SCREW AND CHUCKING MACHINES • SINGLE AND DOUBLE END PRECISION STRAIGHT AND CONTOUR BORING MACHINES • LUCAS PRECISION HORIZONTAL BORING, DRILLING AND MILLING MACHINES

WASHINGTON DEFENSE BULLETIN . . .

- ***WHAT*** **about allocations, priorities and other controls?**
- ***HOW*** **will the defense program affect your business?**
- ***FOR*** **answers to these and other questions, read this report on . . .**

METALWORKING MOBILIZATION

This 8-page bulletin, which replaces the News of Metalworking section for this issue only, is based on personal interviews with key Washington people by American Machinist editors and McGraw-Hill's Washington Bureau staff

METALWORKING'S eyes again are on Washington as defense operations begin to take form. For weeks, government agencies have been in a state of confusion, because no one was sure what was going to happen. Mobilization planners had been caught flat. They had thought in terms of another Pearl Harbor, but not Korea! It took time for the administration to gather its thoughts and decide what to do in this 10% war, as the Korean affair has been referred to.

Eight weeks after North Korean tanks lumbered across the 38th Parallel, the U.S. defense program is shaping up. There still is plenty of bewilderment wherever you go, including the Pentagon, but enough is known to set down what Metalworking can expect in the months immediately ahead. Plans outlined here are based on present thinking. Whatever changes occur in the future are bound to be toward further expansion of war production.

ECONOMIC CONTROLS . . . House and Senate seem agreed on legislation to control the economy the next two years. How and when controls will be used will be left to President Truman. The new control bill will give him discretionary authority to establish priorities, allocate materials and facilities, requisition equipment and supplies, apply price, wage and rationing controls, and regulate consumer and real estate credit. He also will have power to make loans up to $2 billion to industry and make whatever guarantees are needed to expand production capacity and build stockpiles of critical materials. The new bill will permit him to waive anti-trust laws under certain conditions in the interest of defense production.

These controls won't come overnight. It takes time to set up control machinery. Besides, defense demands will grow gradually, not hit all at once. First will come an inventory freeze to limit stocks in hands of manufacturers, distributors and retailers. Hoarders will be ordered to get rid of excessive stocks. Allocation of metals will follow shortly, and over the next six months an increasing share of the supply will be diverted from civilian to military use.

Under "authority to requisition" provisions of the bill, manufacturers might find themselves negotiating with the government if they have tools or facilities the government thinks it needs for essential production. "Fair" compensation will be made for equipment requisitioned, which the manufacturer may challenge in the courts if he thinks it insufficient.

Existing government agencies will be used to administer these controls for the time being. Later on the President probably will create separate administrative agencies, like OPA for prices. Control

WASHINGTON DEFENSE BULLETIN . . .

HERE ARE THE FACTS ON

War production will get under way very slowly. Washington has been tardy in deciding what it wants and how much of it is to be made.

While some $30 billion of military expenditures has been authorized, or twice the dollar budget originally planned for fiscal 1951, much of it will go for expenses other than procurement of weapons (now referred to as "hardware" by defense people). What's more, you don't get as many planes and tanks and guns for your money as you used to, because prices have risen since World War II, and the weapons themselves are far more complicated.

There is talk in Washington that the Department of Defense may ask for $15 billion more, on top of the $30 billion already granted, by next January, or earlier. But that is speculation; and the effect of such additional outlay will not be discussed here.

• **Main interest in Metalworking** centers in the Air Force and Ordnance programs. Overlapping both of these programs is an electronics procurement plan which will involve a considerable segment of Metalworking.

Defense work, as it now looms, will not require more than a 10% effort by industry, as measured in unit output. It won't upset normal operations much the remainder of this year. But as soon as individual programs get rolling, defense will take enough of Metalworking's resources that considerable curtailment of normal manufacture will be necessary.

AIRCRAFT PRODUCTION . . . Some $7.7 billion is being set aside for plane production during fiscal 1951. That puts the year into the class of the fourth largest, in dollars, in aircraft history.

Air Force will get $4.2 billion of the total, Navy $2.5 billion, and foreign aid $1 billion. Bigger part of the funds this will be for building the 69-group Air Force which the government has agreed on.

But bear in mind that the aircraft industry, as matters now stand, will not be engaged in a total mobilization program. Expansion in production now scheduled involves an increase to a rate only one-tenth the peak attained in World War II.

Best evidence is actual output planned: 645 planes per month in

regulations will be enforced by injunction, by prosecution with jail and fine penalties, or by treble-damage suits. Congress suggests setting up a War Labor Board-type agency to settle labor disputes which hamper defense efforts, but the President won't be permitted to bypass either the Fair Labor Standards Act or the Taft-Hartley Act.

ALLOCATIONS OF MATERIALS . . . **Steel allocations, except for voluntary rationing by mills, are unlikely until November. Commerce Department people say that it will take that long to get machinery set up to administer allocations.** It may be more than a coincidence that the date on which the organization machinery will be ready will be after election day. Before allocations are applied, users may be asked to make "inventory reports," stating how much steel of what types and sizes they have on hand.

It will take some time for much of the defense program to get going. That is another reason why allocations of steel will not come immediately. Freight car builders will be one of the early claimants for steel under an allocations system.

NON-FERROUS METALS . . . Washington does not intend to draw on national defense stockpile of strategic materials in the present emergency. The government will go right on stockpiling, because the fact is that materials on hand July 1, 1950, plus an additional $495 million on order, will bring the stockpile up to only one-half the total objective. This means that metals like copper, zinc, lead, and aluminum will continue to be bought in the open market.

Knowing this, consumers are buying non-ferrous metals on a scale that threatens to create a severe shortage. Consumers bought during July and August greater tonnages of copper, zinc and aluminum than current output could supply. End-of-July stocks in zinc dropped to less than 20,000 tons. That's only about a week's supply at today's consumption rates. Lead sellers also have a long waiting list of customers ready to purchase September lead as soon as the books are opened.

There is a plan afoot in Washington to control the flow of metals to defense by putting only steel, copper and aluminum under direct allocation. Steel allocation then would directly and effectively control end uses of tin, zinc (galvanized), manganese, chrome, nickel, tungsten, molybdenum, vanadium, cobalt and other strategic materials. Direct control of copper would give the government a good check on the movement of zinc to the brass industry. Finally, when you control aluminum, you virtually control the light-metals industry.

EXPORT LICENSE CONTROLS . . . More rigid export controls will come before steel allocations. Commerce Department already has moved in that direction. A growing list of commodities, including vari-

SIZE OF THE DEFENSE PROGRAM

1951, compared with 215 per month at time Korean war began and 9,113 per month at the peak of the last war. Despite these figures, the fact is that the job of building today's military planes is far greater than was the task of producing planes in the 1940-1945 period. The 1950 plane, for example, requires four times as many manhours to build as its World War II counterpart. It is twice as complex per pound of airframe weight, and contains twice as many pounds. It is powered with jet engines of complicated design. The engines present many new manufacturing problems involving development of new machining processes.

Still, the planned program is not big enough to warrant rearrangement of production lines to utilize a much larger proportion of semi-skilled and unskilled workers, including women. Employment in aircraft and parts factories, which was 254,800 just before the Korean affair, may be pushed up beyond 500,000 by next summer. At present female workers comprise 12% of the total working force, against 36% in World War II.

ORDNANCE PRODUCTION . . . The score on the Ordnance Department of the Army is this: (1) **It will spend for weapons procurement five times the dollar volume this fiscal year that it did last year; (2) But total outlay will be far short of the one at beginning of World War II;** (3) some Ordnance-owned standby plants are being reopened, with the same companies managing them as in last war, but substantial number of plants still will remain idle; (4) super-bazookas will be made in three widely-scattered plants around the country; (5) pilot lines on important Ordnance components are being set up by certain companies.

Navy Bureau of Ordnance activities are to be only one-fifth the size of Army Ordnance. About three of Bureau's ordnance plants, aside from Washington gun factory, are busy. Aid to western Europe is coming from stocks of naval ordnance in mothballs. There is nothing just now to indicate any sizable expenditure at all for production equipment for naval ordnance, unless mobilization goes a lot farther than planned.

ous kinds of machinery, will need licenses for every export order. Purpose is to prevent critical materials here from going into products for non-essential uses outside this country. A lot of politics and "trading" will go into decisions about export licenses. Licenses will be granted where they will do us good; and will be denied where Washington wants to put on heat. The State Department will have much to say in the decisions.

ADMINISTRATION OF CONTROLS . . . Allocations of materials affecting Metalworking, and priorities on metalworking machinery, are slated to be in the hands of the Department of Commerce. Division chiefs of the Office of Industry and Commerce already have been briefed on what is to happen.

The organization is expected to shape up like this: **Trade divisions of Office of Industry and Commerce (construction, food, forest products, machinery, etc.) will be taken off their regular work and put into separate unit which will function like the War Production Board of World War II.** Present chiefs of these divisions, all of them career men, will operate the new set-up, but will report directly to their division heads, who will be recruited from all branches of industry. Dewey M. Crim is acting chief of the Machinery Division.

Relationship of NSRB to new allocations agency is not yet settled. Certain NSRB officials feel that they should decide "policy," and Commerce merely should carry out their decisions. They don't want to be advisers without the power to see that their advice is put into action. What will happen to the Tools Division set-up for a future WPB, a set-up which has no official status whatever and which is headed by Herbert Tigges of Baker Brothers, Inc., Toledo, Ohio, is a matter of speculation. This division has been a part of NSRB planning. It was originally brought into being to do the job which Commerce apparently has been chosen to do.

CIVILIAN PRODUCTION CUTBACKS . . . There won't be a rash of all-out restrictions on peacetime production. Commerce Department and National Security Resources Board don't yet know how deep mobilization will cut. They have no complete picture of military and essential civilian requirements. But already some signs of future cutbacks can be seen.

To fill new military orders of more than $1 billion the radio and television industry will have to divert 25% of manpower and plant capacity from business-as-usual. Later, electronics requirements of the services will expand sharply. Manufacturers will be operating under priorities for components and raw materials—tubes, resistors, copper. Resistors are already something of a bottleneck. Roughly, one-quarter of the outlay for military planes is said to go for electronics components.

Gasoline supplies are great enough to meet fore-

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seeable military and civilian demands. But the ingredients that "soup up" gasoline for warplanes are short. This means that octane rating of motor gasoline will be downgraded about three points from 89 for premium to about 86, maybe more later. Stepped-up gasoline production cuts down on fuel oil output, and heating oil stocks today are 15 days under normal. So there's a chance consumer supplies this winter may be a bit short.

The automobile industry won't feel the full impact of increased military buying for at least a year. It will take 12 to 15 months to get tank assembly moving in volume, for example. Hence it will be some time before slashing cutbacks in car output are ordered. Best guess for 1951: 75% of this year's total.

Construction activity will be cut back less than 10%. Federal civil works will be slashed only about $250 million, just a shade more than military building will expand. Materials shortages and higher prices will keep state and local spending 10% below plans. Tighter credit will discourage commercial construction and home building. New residential units in 1951 will be held to 750,000, compared with 1.1 million this year.

MANPOWER . . . At this point in mobilization, the government is not doing anything about setting up a War Manpower Commission—as in World War II—to channel workers into essential jobs. Now being talked up is industry-labor cooperation in local areas to see that industry gets the kind of workers it needs. And United States Employment Service is keeping an eye peeled for skilled workers.

In an all-out war, National Security Resources Board would ask for a manpower draft, but Congress will be wary of any proposal along that line. There's too much opposition to the idea on fundamental grounds of individual liberty.

Department of Labor has issued a list (shown in adjoining column) of "critical occupations" as a guide for deferring Reservists and National Guardsmen. Basis for this list: (1) The demand, in essential industries and activities, for persons qualified to work in the occupations would exceed the total supply under conditions of full mobilization; (2) A minimum training time of two years (or equivalent in work experience) is necessary to satisfactory performance of all major tasks found in the occupation; (3) The occupation is essential to functioning of the industries or activities in which it occurs.

• **No War Labor Board** is planned for settling disputes unless defense production should go beyond bounds now indicated. But a plan will be ready; and it will closely resemble the set-up in the last war. Then it was a three-way affair, with representatives of the public, management and labor.

DEFERMENTS PROBABLE FOR THESE SKILLED OCCUPATIONS

Aircraft and engine mechanic—Includes only: aircraft mechanic; aircraft-engine mechanic; airplane mechanic.
Apprentice (Critical occupations only)
Boilermaker—Includes: boilermaker; layout man; fit-up man; boiler-shop mechanic.
Bricklayer, refractory
Coremaker
Driller, petroleum—Includes: cable driller; rotary driller.
Die Setter
Electrician, airplane
Foreman (Critical occupations only)
Glass blower, laboratory apparatus.
Instrument repairman—Includes only: instrument repairman; aircraft instrument man; electrical instrument repairman.
Layout man, marine
Loftsman—Includes only: loftsman, marine; mock-up assembler; loftsman, aircraft; boilermaker-loftsman.
Machinist—Includes: machinist; bench machinist; instrument maker; laboratory mechanic; layout man; marine machinist; job setter.
Maintenance, mechanic
Millwright
Model maker
Molder—Includes only: molder, bench; molder, finish; molder, floor; molder, pattern.
Patternmaker
Precision-lens grinder—Includes only: precision-lens grinder; precision lens polisher.
Roller, iron and steel.
Ship rigger
Stillman, petroleum processing
Tool and die maker—Includes only: die maker; tool maker; tool & die maker.

. . . AND THESE PROFESSIONS

Chemist—Includes: analytical; biological; organic; physical, and inorganic; pharmacognosist; pharmacologist.
Engineer—Includes: chemical (chemical engineer and ceramic engineer only); civil; electrical; industrial; mechanical; mining; petroleum; sanitary; and chief marine engineer.
Metallurgist—Includes metallurgist, extractive; metallurgist, physical.
Physicist
Teacher (critical occupations only)
Tool and die designer—Includes only: die designer; tool designer.

Fred A. Krafft, industrial relations expert, is in charge of the planning for a labor board which is being done by NSRB. All labor disputes settled by War Labor Board in the last war are being reviewed. There seems general agreement that the Board did a competent job and should be revived when and if the right time comes.

There are dissenters. One is Secretary of Labor Tobin, who thinks a new board should be in his department, at least for housekeeping purposes. But if that should happen, industry representatives will not want any part of it.

Another dissenter is Vincent P. Ahearn, who headed the industry side of the War Labor Board

in its last days. He thinks the board should be strictly a government body; management and labor should not participate.

When the showdown comes, however, a tripartite board like the World War II board is almost sure. Two former chairmen of War Labor Board, William Davis and George Taylor, credit its success to its three-way representation.

NEW TAX LEGISLATION . . . Congress will give the President substantially what he asked for in taxes in current stop-gap legislation, and nothing more. The tax bill will provide:

(1) Increased corporate rates, from present ceiling of 38% to a top of 45%. The President is asking for new schedules of 25% normal tax on all taxable income, and a 20% surtax on income above $25,000. Effect would be to raise taxes on companies with net incomes under $31,000, give a break to companies in the $31,000 to $71,000 bracket, and hike rates on those above $71,000. The new rates would apply to all 1950 incomes. **Chances are that Congress will modify the President's proposal to this extent—cut the normal rate from 25% to somewhere between 20% and 25% ; increase the surtax from 20% to somewhere between 20% and 25%; make the effective date no earlier than July 1, 1950, and perhaps as late as October 1.**

(2) Increased individual income taxes. The tax cuts in 1945 and 1948 will be repealed. The result will be a rise of 9% to 17% in rates on a sliding scale, with the low-income group hit harder than the high-income group. Congress will be under severe pressure to soften the blow on the low-income group.

(3) Some loophole plugging. Idea will be to bring in revenue from the investment income of insurance companies, to tax the wholly business operations of non-profit institutions like colleges, and to increase the withholding tax on corporate dividends. Passage of these provisions seem more doubtful than the program outlined in (1) and (2).

Current tax bill is merely a preliminary to a much stiffer bill next year. Then, an excess profits tax will be voted, plus higher rates all along the line.

THESE 100 COMPANIES WERE TOP PRIME CONTRACTORS IN WORLD WAR II

CORPORATION	MILLIONS OF DOLLARS	PERCENT OF TOTAL
All companies—Total	175,063	100.0
100 specified corporations—Total	117,634	67.2
General Motors Corp.	13,812	7.9
Curtiss-Wright Corp.	7,091	4.1
Ford Motor Co.	5,269	3.0
Consolidated Vultee Aircraft Corp.	4,875	2.8
Douglas Aircraft Co., Inc.	4,431	2.5
United Aircraft Corp.	3,923	2.2
Bethlehem Steel Co.	3,789	2.2
Chrysler Corp.	3,394	1.9
General Electric Co.	3,300	1.9
Lockheed Aircraft Corp.	3,246	1.9
North American Aviation, Inc.	2,768	1.6
Boeing Airplane Co.	2,700	1.5
American Telephone & Telegraph Co.	2,562	1.5
Martin, Glenn L., Co.	2,344	1.3
duPont, E. I. De Nemours Co., Inc.	2,186	1.2
United States Steel Corp.	1,974	1.1
Bendix Aviation Corp.	1,869	1.1
Packard Motor Car Co.	1,783	1.0
Sperry Corp.	1,531	.9
Kaiser, Henry J. Co.	1,384	.8
Westinghouse Electric & Manufacturing Co.	1,375	.8
Grumman Aircraft Engineering Corp.	1,330	.8
Newport News Shipbuilding & Drydock Co.	1,245	.7
Republic Aviation Corp.	1,231	.7
Bell Aircraft Corp.	1,228	.7
Todd Shipyards Corp.	1,191	.7
Nash-Kelvinator Corp.	1,162	.7
Studebaker Corp.	1,143	.7
Consolidated Steel Corp., Ltd.	1,097	.6
Goodyear Tire & Rubber Co.	1,091	.6
Standard Oil Co. of New Jersey	1,053	.6
Aviation Corp.	1,045	.6
International Harvester Co.	1,035	.6
American Locomotive Co.	889	.5
Western Cartridge Co.	880	.5
American Car & Foundry Co.	854	.5
United States Rubber Co.	798	.5
Continental Motors Corp.	782	.4
Sun Oil Co.	712	.4
Baldwin Locomotive Works	712	.4
Pressed Steel Car Co., Inc.	664	.4
Permanente Metals Corp.	635	.4
Radio Corp. of America	610	.3
Caterpillar Tractor Co.	602	.3
Allis-Chalmers Manufacturing Co.	585	.3
Norden, Carl L., Inc.	555	.3
Diamond T. Motor Car Co.	535	.3
Willys-Overland Motors, Inc.	522	.3
California Shipbuilding Corp.	503	.3
Bath Iron Works	498	.3
American Woolen Co., Inc.	493	.3
Emerson Electric Manufacturing Co.	487	.3
Consolidated Builders, Inc.	478	.3
White Motor Co.	471	.3
Firestone Tire & Rubber Co.	455	.3
Pullman, Inc.	455	.3
Philco Corp.	452	.3
Anaconda Copper Mining Co.	446	.3
Federal Cartridge Corp.	439	.3
Fairbanks, Morse Co.	414	.2
Northern Pump Co.	411	.2
Eastman Kodak Co.	407	.2
Mack Trucks, Inc.	396	.2
Food Machinery Corp.	392	.2
Hercules Powder Co.	366	.2
Remington Rand, Inc.	359	.2
Goodrich, B. F. Co.	359	.2
Brown Shipbuilding Co.	357	.2
Beech Aircraft Corp.	351	.2
Higgins Industries, Inc.	349	.2
Raytheon Manufacturing Co.	348	.2
Dravo Corp.	343	.2
Fairchild Engine & Airplane Corp.	334	.2
Smith, A. O., Corp.	329	.2
Standard Oil Co. of California	327	.2
General Cable Corp.	325	.2
Electric Boat Co.	324	.2
Jack & Heintz, Inc.	312	.2
Royal Dutch Co.	308	.2
Crucible Steel Co. of America	300	.2
American Shipbuilding Co.	294	.2
Moore Drydock Co.	292	.2
Hudson Motor Car Co.	290	.2
Brewster Aeronautical Corp.	281	.2
Autocar Co.	279	.2
Socony-Vacuum Oil Co., Inc.	276	.2
Jacobs Aircraft Engine Co.	269	.2
Ingalls Iron Works	265	.2
Western Pipe Steel Co. of California	264	.2
American Can Co.	261	.1
General Machinery Co.	261	.1
Chicago Bridge & Iron Co.	260	.1
Texas Co.	260	.1
Galvin Manufacturing Corp.	243	.1
Stewart-Warner Corp.	242	.1
Revere Copper & Brass Inc.	241	.1
New England Shipbuilding Corp.	235	.1
Missouri Valley Bridge & Iron Co.	233	.1
Colt's Patent Fire Arms Manufacturing Co.	233	.1
Northrop Aircraft, Inc.	232	.1

Source: "Economic Concentration and World War II," Report of Smaller War Plants Corp. Source of figures — War Production Board.

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DEPRECIATION OF PLANT AND EQUIPMENT . . . Congress has before it various proposals for liberalizing depreciation rates on new plant and equipment. One proposal is that manufacturers be allowed to set their own depreciation rates on new machinery, as they did prior to 1934.

Best guess is that no change in current write-off rates will be authorized this year. **But a new depreciation law is almost assured in 1951. Chances are slim, however, that machinery buyers will be given the right to name their own rates. Much more likely is a plan calling for the five-year amortization used in World War II.** This accelerated depreciation privilege won't be extended to all machinery buyers; it will be limited to those engaged directly or indirectly in defense work.

RENEGOTIATION . . . Renegotiation rules are to be changed in a new administration bill. This bill subjects all private contracts with the government—non-defense as well as defense, competitively bid as well as negotiated—to renegotiation. It sets up a new board to administer the law. This board will have power to exempt anything it wishes from renegotiation, such as "collateral" items which at present are exempt. Last December, for example, ruling was made that all subcontracts for materials or equipment not ending up in final product are exempt. Machine tools are excluded, at present, from renegotiation.

- **All military procurement** is renegotiable at present if the contract is a negotiated contract and if deliveries during the fiscal year total at least $100,000. The criterion is not the value of contracts signed in any one year. It is the value of the deliveries made.

How much Washington lets you keep depends on the "exercise of judgment." Percentage of allowable profit runs from 2% to 20%. Six factors are considered in determining how much the government will recapture: (1) efficiency of the contractor; (2) reasonableness of cost and profits; (3) amount and source of private and public capital employed and net worth of the company; (4) extent of assumed risk; (5) nature of contribution to "war effort;" and (6) character of business, including complexity of manufacturing technique.

- **All Air Force contracts,** bid or negotiated, using money from 1948 Supplemental Appropriations Act for aircraft and parts, electronics, conversion of government plant facilities and other items making up a 70 group air force, are subject to renegotiation. Source of the money is the only test. Air Force is still awarding contracts paid out of this appropriation.

NEW E-1-B PLAN

EDITOR'S NOTE—Plans for priorities on production equipment in case of large-scale mobilization are printed here for the first time. This is an AMERICAN MACHINIST "exclusive."

PRIORITIES ON PRODUCTION EQUIPMENT . . . Don't look for a revised General Preference Order E-1-B to be put into effect soon. Amount of business in machine tools and other production equipment immediately ahead doesn't warrant such action.

What's more likely is a simple rating for all defense orders, such as 1, 2 and 3. This kind of rating system is almost sure to precede E-1-B, as deliveries get longer and some sort of priority becomes necessary.

But even a 1-2-3 rating plan is not contemplated right away. It can be staved off a bit, too, if equipment builders will voluntarily give preference to defense work.

There is no secret though that National Security Resources Board has a 1950 version of E-1-B ready for instant use. Its name: "Emergency Control Order for Delivery of Industrial Equipment."

PROVISIONS OF NEW E-1-B PRIORITY PLAN . . . If and when the "Emergency Control Order" takes effect, priorities will govern production equipment deliveries almost completely. Main provisions of this Order are that: (1) Starting on first of every month, each builder shall schedule deliveries of each size of machines for the fourth ensuing month—70% to "service purchasers" and 30% to "other purchasers" (on August 1, for example, a builder sets his November schedule); (2) "service purchasers" means all elements of Department of Defense or prime or subcontractors; (3) "other purchasers" includes Atomic Energy Commission, all foreign buyers, including Canadian (except when Canadian company is working on U.S. prime or subcontracts).

- **Builders may maintain** delivery schedules set up at time E-1-B goes into effect for 90 days thereafter. Only change would be by diversion directed by the civilian control agency. The stated percentage of machines for each service group, when applied to a producer's output of each size of a given type of tool in a given month, establishes the minimum "quota" for the group of that size and type of machines during that month.

No deliveries are to be made by a machinery builder earlier than the purchaser asked for, unless all other required dates of customers are being met. No order can be scheduled by a builder unless a firm order is accompanied by specifications or other de-

READY FOR USE IF NEEDED

tailed description enabling the builder to place the machine in his production schedule.

PREFERENCE RATINGS . . . In applying for or extending preference rating to an order for machines, the purchaser must supply this information: (1) preference rating certificate; (2) required delivery date; (3) statement whether he is service purchaser or "other purchaser"; (4) if machine is for "other purchaser" purposes, purchaser must state what program the machine is being bought for; if the machine is for foreign delivery, the country of destination and authority for delivery must be given.

Urgency standings, when necessary, will be issued under the order and will be assigned to delivery of machines. Unless the civilian control agency specifically orders otherwise, no preference rating received by a builder shall postpone or improve delivery of a purchase order, rated or unrated, which is scheduled for delivery during the ensuing 90 days.

Civilian control agency, incidentally, may direct or change any schedule of production or delivery of machines; allocate any order for machines to any other producer; divert or otherwise direct delivery of any machine to any other person than the one originally intended.

• **Urgency standings** are set up for end items by the Joint Chiefs of Staff. These standings determine the sequence of deliveries among service purchasers on the following basis:

(1) Delivery sequence among each group of service purchasers within its own quota shall be determined monthly without regard to preference ratings.

(2) Deliveries to service purchasers either on the list or to subcontractors of persons on the list shall take precedence over service purchasers not on the list.

(3) As between conflicting delivery dates among service purchasers, priority goes to the purchaser with the higher urgency standing.

(4) Sequence of conflicting deliveries to service purchasers not on the list shall be decided by the respective dates on which the builder receives the preference rating.

(5) Delivery to a subcontractor not mentioned on the list takes the urgency standing of the prime contractor, but the subcontractor cannot use this preferential standing unless he has endorsement of the service bureau concerned.

WHERE E-1-B APPLIES . . . The new version of E-1-B is to be applied to these products: **all machine tools (non-portable, power-driven, selling for $500 or more for basic machine); presses; brakes; hammers; headers; marking machines; die-casting machines; extruding machines; forging machines; measuring and testing machines; welding machines; shears; levelers; ammunition machinery; forging rolls; riveting machines; rifle and gunworking machines; punching machines; tube-reducing machines; upsetters; swaging machines; oil-grooving machines; nibbling machines; pipe flanging and expanding machines.**

MERITS OF NEW E-1-B . . . Advantages of new program are: (1) distribution of machines in balance with over-all war-production plan; (2) prevention of one claimant from preempting supply, and assuring each claimant at least a portion of his needs; (3) each claimant can distribute his share as he thinks best; (4) each claimant is induced to economize in ordering machines; (5) as promptly as the builder has more orders on hand than he can fill, the control order provides a formula for arranging delivery sequence. The control does not become operative until needed, and then automatically; (6) no large staff is required to administer the plan.

• **Basis for establishing a new E-1-B** is the fact that the first great critical requirement in a war emergency is metalworking machinery, and particularly machine tools. Conversion of industry to wartime operations is dependent on the availability of large numbers of all types of machine tools, which occupy a unique position in a mechanized economy such as ours.

The plan must provide for large-scale expansion of the production of machine tools in the shortest time. Next step is to assure a balanced distribution of the output of these machines.

First job is to produce as many machine tools as possible in shortest time by means of "phantom orders" (which are similar to pool orders of World War II) as well as regular orders from customers. After that, the output of machine tools must be distributed equitably through a special control order (E-1-B). Priorities alone will be inadequate to meet the situation.

Each builder of machine tools and other production equipment, as soon as the revised E-1-B takes effect, will be asked to maintain his purchase order board in such manner that it will show that the control order is being carried out.

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MILITARY AID TO EUROPE... The building up of western Europe's military forces and their proper equipment is part of the U.S. plan of defense against communism. This means that Washington is committed not only to sending "hardware" from this country, which has been in storage, but also to producing military goods here for shipment abroad. On top of that, the United States has agreed to provide funds for tooling war-production plants in European countries, and to buy machinery here for installation over there.

All countries in western Europe have adopted or are about to adopt expanded programs for production of various kinds of war goods. The bulk of this increase is in aircraft, particularly jet engines. Aircraft is especially dominant in France and Britain.

Approvals already have been given in Washington for retooling expenditures by French companies, for instance, for U.S. machine tools in connection with jet engine programs. Up until now, almost all U.S. procurement expenditures for European military aid have been spent in this country. But that is no longer true.

• **Western Europe will be permitted to buy** production equipment wherever it can get it. Moreover, offshore purchases of military end items by U.S. for delivery to European nations will ease the financial problem for them. The President's request for $4 billion in increased arms aid for our allies contained very flexible provisions as to how the money can be spent. One way: to place orders for guns in any country where they are available cheaper and quicker than in the United States.

• **In Britain, the problem of shifting to arms** production is very difficult. It would mean loss of export markets; and right now the demand on British industries from Asian and Latin-American countries is at an all-time high. Washington plans to help the British, according to reliable reports, by restraining U.S. exporters from moving into Latin America.

To cut down the tremendous demand of the sterling area countries on British industries, the United States will increase its share of Britain's defense load.

Marshall Plan aid will take on a different complexion in the face of the rearmament program. For one thing, more food and more raw materials will have to go to Britain and the Continent. In addition, some of ECA funds will be shifted to financing the arms program instead of going toward furthering economic objectives.

U. S. MUST GET OUT OF KOREA AFTER VICTORY

By ALPHEUS JESSUP
McGraw-Hill World News

TAEGU, KOREA. . . . Peace for Korea will be much more elusive than victory. Withdrawal of UN forces after victory would solve nothing. It would leave a worse political fester than a Korea abandoned to communists. Turning Korea over to the discredited South Korean government would be no better.

U.S. long-term objective must be an independent Korea with a popularly supported government. All solutions and controls must be developed by the UN. While U.S. must bear the cost in lives, supplies and rehabilitation, it can play only a subordinate role, if any. For South Koreans, as well as northerners, have little love for us.

Following conditions are viewed by U.S. and UN representatives as minimum requirements for peace:

(1) Korea must be unified. Every Korean wants a one-piece Korea. Economically the country needs unification.

(2) UN must provide protection and guidance for Korea, though Koreans will resist such efforts. Solution can be found in a UN trusteeship composed of three powers other than the United States and Russia.

(3) Koreans must reorganize their government with UN assistance. But first they must sweep out their old government, which has won the disrespect of the people.

(4) Korea's economy should be allowed to develop freely with no restrictions on its relations with any neighbor.

(5) No military bases or any single foreign power should be established in Korea.

What people would like to hear now is an American declaration regarding Korea which would leave the decisions in UN hands. Negotiated unity might be less difficult than imagined.

Most of Korea's industrial establishment as well as its farm communities, will require rebuilding because U.S. Air Force bombers have ranged unopposed over north Korean centers. All rail marshalling yards, major railway repair shops and large amount of rolling stock are knocked out.

TALKING SHOP

Frankfurt Math

How does a man used to working in steel decide how many hot dogs to buy for 50,000 people? Bill Verity, at Armco Steel Corporation faced that problem when Armco decided to celebrate its 50th anniversary with a picnic for the townspeople. He went at like an engineer. Inquiry showed that small boys would eat ten, while big girls would only eat one. He quickly developed a formula, got out his slide rule, and came up with the answer: eight tons. He was right, too.

Why Plate Fails

When an electroplated surface fails in service, the blame is usually placed on the plating job. Dr. C. L. Faust of Battelle Memorial Institute tells us this is often not the case. The surface of the steel is often damaged in machining. For instance, he has found steel with 100,000-psi tensile with only 35,000 psi on the surface. If this damaged area starts to peel off, the best plating job in the world won't stop it. If you're having plating troubles, it may pay you to check the surface of the parent metal.

Anticaking Tips

When you need a coolant in machining cast iron, as is sometimes the case, the dust may cause trouble by caking up on tools. If the tools are carbide, they are likely to crack when the cake breaks off the tip, exposing it to coolant. It will help to shift the coolant supply from the top of the tool to the side or bottom. It will also help to put anticaking additive in the oil.

Microstructure Ahead

We find more and more interest in microstructure these days. Michael Field did some research several years ago that showed a definite relationship between microstructure and machinability in cast iron. That is, two irons may have identical physical properties but entirely different machining characteristics. This would show up as a difference in microstructure. Now there is a lot of talk in metallurgical circles about extending this to other ferrous metals. We may see the day when shop men talk as casually of pearlite and martensite as they do about rake angles and chip disposal.

Tile Floor Good

Green asphalt-tile floors have been found to have many advantages in a stamping plant equipped to make small precision articles. First, they are easily kept clean, so small particles of dirt are not carried into the dies to wear them and mark the product. Second, the resilient floor covering avoids worker complaints. Third, sections are easily and cheaply replaced in case of damage, which is infrequent.

Optimums

"It is only by using our machine tools at their optimum capacities that we are ever going to reduce costs. Certainly new machine tools are indicated, but I have always felt that the majority of shops never have used their present equipment at anywhere near optimum." So writes an executive of one machine-tool company, discussing high-speed machining (see latest article, Aug. 7 *AM*).

Between these two acknowledgedly factual sentences hangs the fate of many a company. In cases we've noticed, rarely is the reason for inefficient machining lack of willingness or alertness on the part of management, but rather lack of knowledge. By contrast, lack of willingness and alertness frequently is obvious among operators—usually because company personnel relations are no good. Operators and foremen can get higher speeds and higher production — if they believe that it's for the good of the team. Instilling that spirit takes honesty and sincerity — and in larger plants often involves outmaneuvering anti-management labor groups.

Part-time Lapper

Although it may be used only occasionally, a centerless lapping machine is a great convenience in finishing dowel pins and punch bodies. Good finish on such parts, plus dimensional accuracy, are essential.

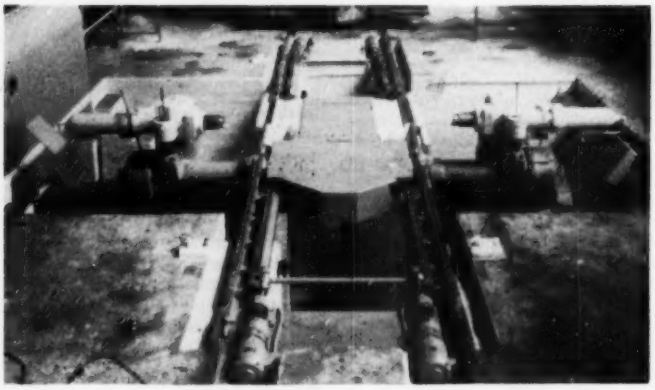
Dies in Parts

Sectional die construction saves building and repair time. If die bases and punch holders are a channel section, square and rectangular die parts or punch elements are readily surface ground to an exact fit.

Neighborhood Mystery

Battelle, the industrial research organization, now has 1250 people working in a half-million square feet of laboratory space. But it remains a mystery to its neighbors in Columbus. A favorite pastime in the area is to go over the headquarters around five o'clock and watch "those queer people come out." Now recognizing the problem, Battelle is beginning local promotion to explain itself to its neighbors. We don't want to discourage them, but last month there was at least one cab driver in Columbus who thought they made gravestones.

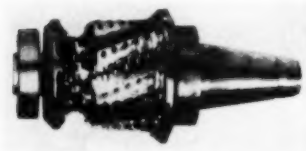
New Shop Equipment



Diesel-Locomotive Wheels Milled On Spot By Wheel Truer

Worn wheels are restored to proper contour without removing them from the locomotive by this Standard wheel-truing machine. It is able to recondition the wheels of a diesel in less than one working shift, using two operators.

The wheel-truing machine is raised into operating position and the tailstock centers are engaged with the wheel-axle centers. The wheel-drive rollers and the cutters are started and the depth of cut is adjusted by electrically operated feedscrews. One revolution of the wheels, after the cutters are set for depth of cut, restores the contour and the pair of wheels are identical. If the amount of metal removed does not restore the proper contour, another cut is taken. The entire cycle from the time the equipment is placed on the pit until it is removed will average one hour per pair of wheels.



The introduction of this machine is said to be the first successful application of the principle of slab milling on materials as hard as 500 Brinell. The cutter is a solid arbor and cutter body which has a series of sockets holding approximately 90 indexible and replaceable carbide cutting cylinders. These cylinders are expendable and require no regrinding, therefore there is no cutter maintenance other than reindexing for new cutting surfaces and replacement of the cylinder when all cutting surfaces are used up. Each cylinder can be indexed eight to ten times on each of its ends, making a total of 16 to 20 cutting edges per cylinder. They are usually inspected after cutting four pairs of wheels and those requiring it are indexed, making the carbide expense small.

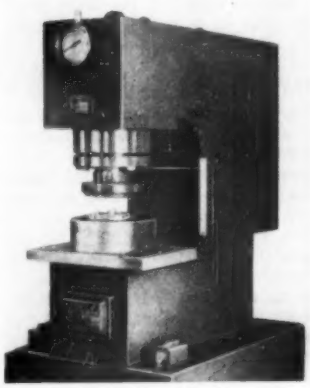
Standard Railway Equipment Mfg. Co., 310 S. Michigan Ave., Chicago 4.
(MORE DATA? CIRCLE FYI 31, p. 159)

Richly Pigmented Zinc Paint Produces Galvanic Action

Tests on a paint-like compound called Zinkrich indicate that it affords the same galvanic protection to steel as hot dipping or electroplating. The compound may be applied with brush, spraygun, or in a dipping tank. It is not a metallic paint, however, in that it produces electric continuity with the underlying metal. The dried film contains 96% zinc to 4% of binding media by weight.

Laboratory experiments have shown that Zinkrich will not only protect clean iron or steel surfaces, but also surfaces contaminated with porous surface-rust formations. Extract from the Zinc Development Association's technical memorandum of Nov., 1946, No. 6, London, England: In one weathered-steel specimen "it was shown that there was initially no electrical contact between the paint film and the metal because of the layer of rust present, but after two days immersion in sea water, contact was established. It appears that under these conditions the metallic-zinc pigment is capable of reducing the rust either to magnitite or to metallic iron, to form electrically conductive bridges between the paint film and the metal surface."

Zinkrich Co., Inc., 42 Broadway, New York 4, N. Y.
(MORE DATA? CIRCLE FYI 32, p. 159)

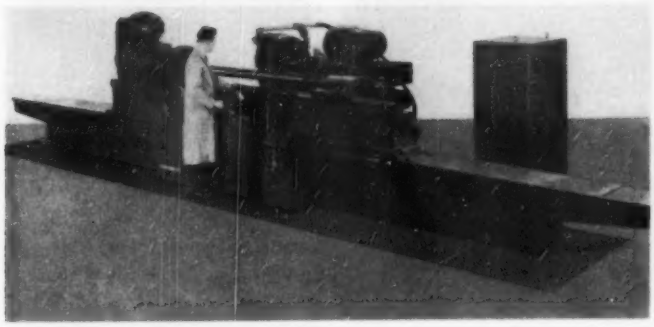


Press Automatically Reverses At Given Pressure Setting

This C-frame hydraulic press features automatic reversal at pressure setting, dual speeds, rapid advance, and slow pressing speed at full load. The press may be operated by pushbutton, manually, or by pedal valve or electrically controlled foot switch. Capacity is from 5 to 75 tons.

M & N Machine Tools Works, Inc., 299 Allwood Road, Clifton, N. J.
(MORE DATA? CIRCLE FYI 33, p. 159)

Materials and Parts



Cincinnati 16-In. Grinder Equipped with 40-In.-Gap Table

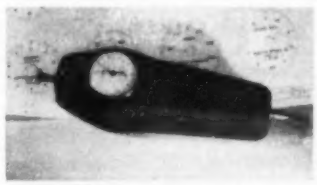
A center-type grinding machine with a gap table, for grinding locomotive piston rods and similar parts requiring additional swing for a large diameter of short length, has been announced by Cincinnati Grinders. These machines have a nominal 16-in. swing, 40 in. over the gap, and are built in four lengths; 96, 120, 144, and 158 in. In general, the machines have the same design features as Cincinnati Filmatic 14- and 16-in. plain grinding machines. The grinding-wheel spindle runs on Filmatic bearings, a segmental construction which develops high-pressure wedge-shaped oil films between the segments and spindle diameter. These bearings automatically adjust themselves to variations in forces created by the grinding action. Lubrication is automatic, preceding spindle rotation, which it initiates through a pressure switch. Should the lubricating system fail, the grinding-wheel drive motor automatically stops, preventing damage to the bearings.

A 20-hp. motor drives the grinding-wheel spindle through matched V-belts; 2 horsepower for the headstock and 1½ for the table drive. Net weight of the machine, completely equipped, approximates 32,800 lb for the 96-in. length or 42,000 lb for the 68-in. length.

Automatic wheel balancing is available as extra equipment. Controlled by a lever reached from the operator's normal working position, the grinding wheel can be balanced in a few seconds without removing the wheel mount from the machine.

Cincinnati Grinders, Inc., Marburg Ave., Cincinnati 9, Ohio

(MORE DATA? CIRCLE FYI 34, p. 159)



Force Indicator Shaped For One-Hand Operation

This instrument uses a compensated-spring mechanism and a fully-jeweled dial indicator to measure and indicate force. Its over-all accuracy is one-half of one scale division on the dial indicator. It is shaped for one-hand operation and is supplied with six stainless-steel force-transmission rod fittings which give the indicator a wide range of usefulness in measuring force by either a push or pull action.

The company has increased its line of these indicators to 12 models. It is available in capacities of one, two, five, ten, and twenty pounds; 16, 32, 80, and 160 ounces; and 500, 1000, and 5000 grams.

Hunter Spring Co., 1 Spring Ave., Lansdale, Pa.

(MORE DATA? CIRCLE FYI 35, p. 159)

... INCLUDING

Nut-driving machine drives nuts on studs automatically, eliminates all manual handling ....page 154

Non-destructive tester employs ultraviolet light to test bulky objects in daylight .....page 155

Spot-welder utilizes an air-storage system to develop constant electrode pressure .....page 155

Rotary-fixture machine bends irregular shapes or true radii in sections up to 8-in. wide..page 156

Die caster enables manufacturers to make small parts in their own shops.. .. .. page 170

Flute miller designed for fast, accurate milling of straight or spiral flutes .....page 164

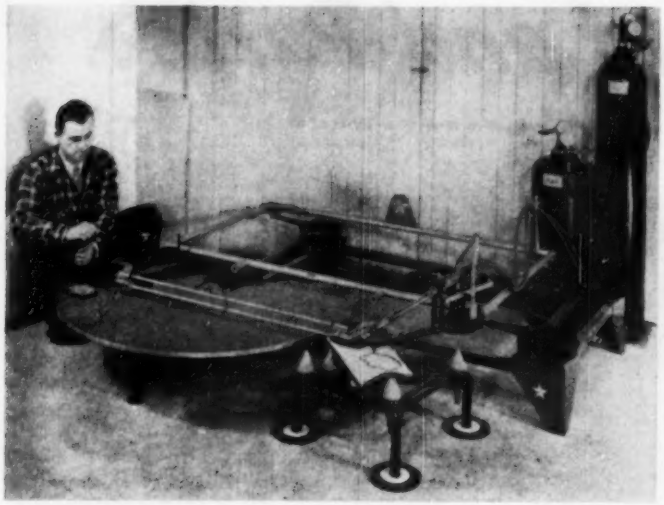
Fire-protection system makes use of the photoelectric principle to detect fires .....page 166

NEW BULLETINS for your Shop Library, including a 384-page catalog covering gears and power-transmission. pages 159 and 160

. . . and in September 4

Countersinking tool employs an expanding mandrel to hold it to the work, has succeeded in saving 80% in time.

Plastic-metal screw saves assembly time by doing away with separate insulating parts. The metal core carries all the torque.



Pantograph Torch Holder Used for Contour Flame Cutting

Torch holder for contour flame cutting and butt-welding, operates on the principle of the pantograph. The torch arm is adjustable to fit various hand and machine torches. The workpiece stand is adjustable for different thicknesses of steel without changing the supports. For large sheets of steel, additional workpiece stands or posts are supplied. The heart-shaped operating table may be attached to either the right or left-end of the machine. The operating arms are also interchangeable, and the steel workpiece stand may be moved as desired.

The holder will cut circles or rings up to 24 in. in diameter, straight cuts 52-in. long, squares and combinations of curves and angles. Adjustable templets are furnished.

Krohn Manufacturing And Supply Co., Centreville, Mich.

(MORE DATA? CIRCLE FYI 36, p. 159)

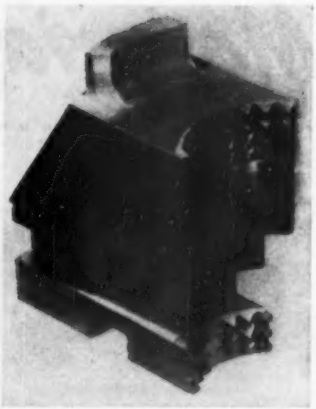
Midget Pumps Have Bigger Reservoir Capacity

The original Dusenbery midget hydraulic pump was put on the market in 1947, when it was first announced in this magazine (AM Sept. 11, '47 page 366). Besides the 5-pint-capacity reservoir models previously put out, the line now includes units with 3 gal. capacity reservoirs. Six and one-half pint reservoir units are also available on special order.

The reservoir is mounted on either an open, a totally enclosed, or an explosion-proof motor, and the pump, check valve, and relief valve are enclosed. Both reservoir and bulkhead are made of aluminum, and units with open motors have aluminum motor frames. Pressure and return line connections are for ⅜ O.D. flared tubing, but ¼-in. pipe thread or ¼-in.-hose coupling connections can be supplied on special order. Output volumes range from 0.1 gpm to 2.8 gpm according to the unit selected; pump pressures are preset at the factory according to customer specifications. Priced from $123, the models are adaptable for portable use.

John Dusenbery Co., Inc., 271 Grove Ave., Verona, N. J.

(MORE DATA? CIRCLE FYI 37, p. 159)



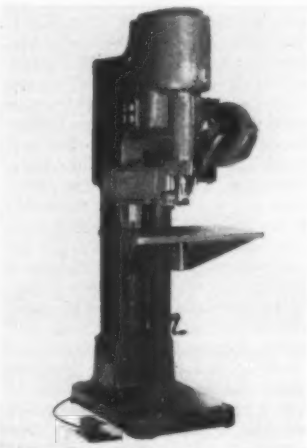
Colmonoy-Tipped Chuck Jaws Last Longer, Are Easily Replaced

A hard-facing alloy known as Colmonoy is being used in making cast inserts for chuck jaws. It is claimed that these chuck jaws have a longer life with greater accuracy than tool-steel jaws.

The insert is silver-soldered to the jaw so that it is only necessary to heat to effect replacement. The inserts may be bought separately or as a complete jaw with the Colmonoy inserts ground in place.

Diamonds and Tools, Inc., 19345 John R. Street, Detroit 3, Mich.

(MORE DATA? CIRCLE FYI 38, p. 159)



Nut-Driving Machine Eliminates All Manual Handling

The urgent need for more efficient and rapid assembly of nuts is said to have been solved by this machine. The result of 4½ years of research and development, it will drive nuts

on studs semi-automatically or automatically, eliminating all manual handling save to load the rotary-barrel hopper periodically with a fresh supply of nuts.

The hopper keeps the machine continually charged with an ample supply of nuts, and feeds them in a prepositioned manner to the driving spindle, making it necessary that the operator handle only the parts to be assembled by placing them in the locating fixture mounted on the work table.

The machine will handle nuts between 5/16-in.-minimum to 11/16-in.-maximum across flats. It will drive special nuts such as jam, castillated, or lock.

Detroit Power Screwdriver Co., 2803 W. 4th St., Detroit 16, Mich.
(MORE DATA? CIRCLE FYI 39, p. 159)

Portable Ultraviolet Light Tests Bulky Work in Daylight

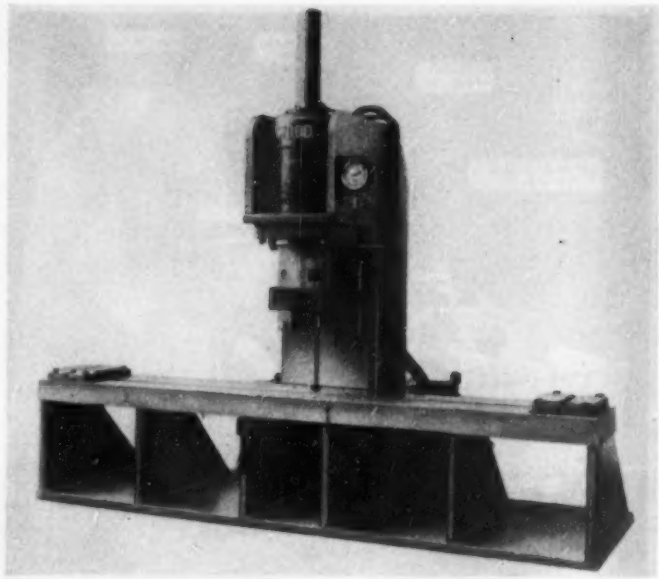
For non-destructive testing of objects too large for transport to a blacklight booth, the Menlo Fluoretor combines portability with a light-tight chamber to exclude light from the area examined.

Two standard Size D flashlight batteries supply power for the ultraviolet generator. This is attached by a swivel joint to the wand-type handle containing power components. A focusing eyepiece on the dark chamber provides 3X magnification.

A sponge-rubber cone improves the light seal on rough surfaces and a series of specimen-holding end caps for the dark chamber hold objects smaller than the chamber.

The surface is swabbed with fluorescent oil, washed, and coated with developing fluid in the standard procedure for ultraviolet testing. Under ultraviolet light, cracks and fissures fluoresce and can be detected.

Menlo Research Laboratory, Box 522-BY, Menlo Park, Calif.
(MORE DATA? CIRCLE FYI 40, p. 159)

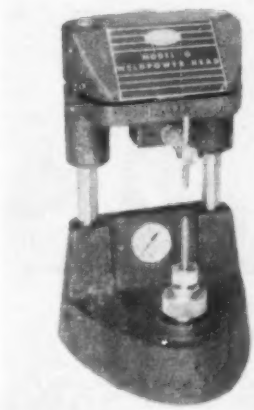


R. D. Wood Builds 100-Ton Open-Gap Straightening Press

A 100-ton hydraulic press used for straightening operations on tubes, shafts, bars and similar pieces has a 13-in.-diameter main ram with a 12-in. stroke. The working table, measuring 22 in. x 12 ft., and with 26 in. of daylight between it and the ram head face, is supplied with two bases in machined grooves for the assembly of disks or anvil blocks. These bases are moved in increments of 6 in. to any required distance on either side of the center of the press.

The ram head is grooved for the attachment of dies. Hydraulic power is supplied by a two-pressure pumping unit and motor, mounted on a fabricated-steel suction tank at the rear of the press. Press control is through a 4-way lever-operated piston-type valve, located at the operator's station.

R. D. Wood Co., Philadelphia 5, Pa.
(MORE DATA? CIRCLE FYI 41, p. 159)

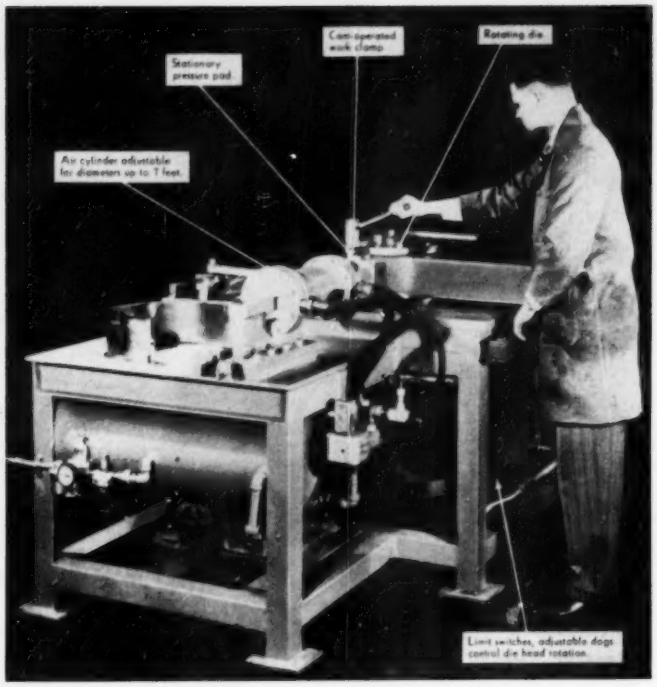


Spot-Welder Head Gives Accurate Electrode Pressure

A bench-mounted spot welder utilizing a metallic-bellows air-storage system for consistent electrode pressure has been developed by Raytheon. An air-gage in the base of the welder head is said to give instantaneous indication of electrode pressure and permit rapid adjustment to a pre-determined value. A small hand pump supplies the necessary air pressure.

The low mass (3½ oz.) of the moving parts is said to give instantaneous electrode follow-up for forging action. Mounting area required is 7 x 7½ in.; spot welder is 1 ft high.

Raytheon Mfg. Co., Dept. 626 ONR, Waltham 54, Mass.
(MORE DATA? CIRCLE FYI 42, p. 159)


Cam-operated work clamp
Rotating die
Stationary pressure pad
Air cylinder adjustable for diameters up to 7 feet
Limit switches, adjustable dogs control die head rotation

Rotary-Fixture Machine Bends 8-in.-Wide Sections

This rotary-fixture machine will bend irregular shapes or true radii in tubing, bars, extrusions, or roll-formed sections up to 8 in. wide. It employs a horizontal stationary pressure-pad which is air-operated against the rotating diehead. The diehead is mounted on a heavy vertical spindle which is gear-driven by a 7½-hp. motor.

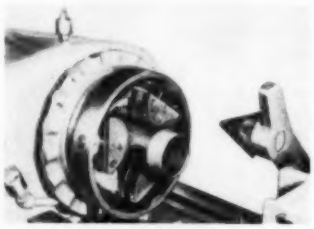
Limit switches and adjustable dogs control the degree of rotation of the diehead during the working cycle and are easy to set to provide the required angle of bends. Electrical pushbuttons permit starting, stopping, or reversing the cycle at any point. The adjustable slide mounting of the air cylinder provides the capacity for handling bends up to 7 ft in diameter. Change-overs in tooling setup from one part to another can be easily made by one man in 30 min.

The stationary pressure-pad avoids single-point contact on the work, acts as an ironing shoe, and is claimed to assure smooth, wrinkle-free bends. The operating control of the diehead, which can be set to continue forward after a bend is made, or reverse to starting position, assures means of controlling the accuracy of bends.

To meet varied pressure requirements, the unit is designed to accommodate either a 6-in. or an 8-in. air cylinder. A stroke of 12 in. is standard. Pressure tank, pressure regulator, and lubricator are included as standard equipment.

Pines Engineering Co., Inc., Aurora, Ill.

(MORE DATA? CIRCLE FYI 47, p. 159)



Self-Adjusting Chuck Speeds Work Handling

Speed with which work may be chucked or repositioned on the Peerless Roto-Lok chuck is said to be substantially higher than that obtainable with conventional scroll chucks. Centering and gripping of the stock are done by means of three sector-shaped driving jaws. These are pivoted in the center to provide a rocking action and permit clamping workpieces on either side of the center, at any point on the curved edge of the jaw. Thus parts may be chucked for driving in either direction.

Simultaneous movement of the jaw is controlled by the handwheel located at the back of the chuck. Each jaw is made of hardened alloy steel and has milled serrations along the curved edge. Work held in the jaws may be repositioned or removed from the chuck without halting the spindle rotation. To release jaw pressure the part is grasped in the hand and rotated forward faster than the spindle speed.

The chuck holds pipes and rounds from ⅜ to 2⅜ in. O.D. Workpieces as short as 2½ in. in length can be handled.

Peerless Machine Co., 1600 Junction Ave., Racine, Wis.

(MORE DATA? CIRCLE FYI 48, p. 159)

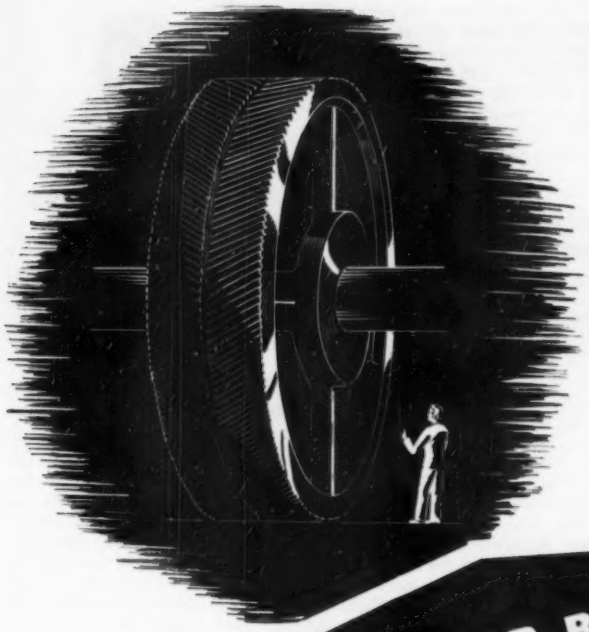
Clark Fork Truck Has Reduced Width, Greater Speed

Reduced over-all width and increased speed are among the features of a 3,000-lb-capacity electric Carloader lift truck. Automatic acceleration provides smooth and even variations of motor speed through a master power switch regulated by an automatic timer. Controls are the non-plugging type which prohibit change in the direction of travel until the motor comes to a full stop.

Lift heights are available in a range from the standard 84 in. with over-all height of 61 in. with forks down, to 130 in. and an over-all height of 84 in. with forks down.

Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich.

(MORE DATA? CIRCLE FYI 49, p. 159)



IS YOUR GEAR DEPARTMENT READY?

to meet competitive production rates?

to meet competitive costs?

AS BIG OR BIGGER AS SMALL OR SMALLER

Michigan's "1950" production gear finishers are designed to produce all ranges of spur and helical gear sizes—external or internal; continuous runs or job lots—more accurately, at lower cost. Here they are:

#861—for gears of ¼″ to 4″ OD
#900—for gears 1″ to 8″ OD
#870—for gears 1″ to 18″ OD
#873—for gears 2¼″ to 24″ OD
#865—for gears 4″ to 48″ OD

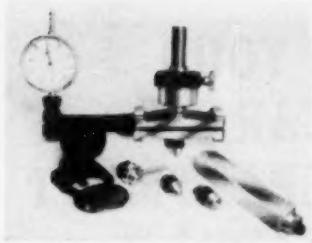
PLUS—finishers for gears up to many feet in diameter

Ask for bulletins by machine number.

COMPLETE — *from blank to finished gear* — EQUIPMENT

MICHIGAN TOOL COMPANY

7171 E. McNichols Road
Detroit 12, U.S.A.



Portable Hardness Tester Has Wide Range of Application

Portable Brinell-hardness tester has three sizes of ball penetrators, separately mounted and interchangeable. The sizes are 2.5, 5, and 10 mm. Three styles of holders or shanks are readily adapted for use in the ordinary vise or C-clamp, arbor press, or sensitive drill, or any other machine tool. Tests can be made with this instrument on rolls or molds during machining operations.

Amount of pressure to be applied and the size of ball to be used are designated by a chart which takes into consideration both the thickness and the nature of the metal or mass under investigation. By following this chart, correct studies can be made of thin specimens not heretofore within the range of "penetrating types" of hardness tests. The pressure range of the instrument is 50.62 to 750 kilograms.

The R. Y. Ferner Co., 110 Pleasant St., Boston 48, Mass.

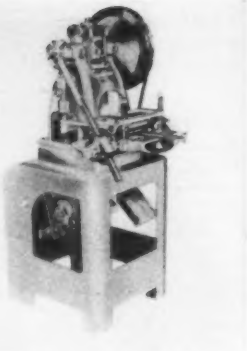
(MORE DATA? CIRCLE FYI 50, p. 159)

Stainless Steel Made Cheaper By Reducing Carbon Content

Stainless steel, called 430 ELC, reduces the cost of the special stainless steel required for metal-glass television tubes. In order to get continuous thermal contraction of about the same rate as glass during cooling, it was formerly necessary to use either 28 or 17% chromium steel with special stabilizing elements. These ferritic alloys can be sealed to glass successfully because they undergo no phase change on cooling after the glass-sealing operation. Stainless 430 ELC costs less because the use of the expensive stabilizing elements has been reduced by lowering the carbon content to below 0.03%.

Armco Steel Corp., Middletown, Ohio

(MORE DATA? CIRCLE FYI 51, p. 159)

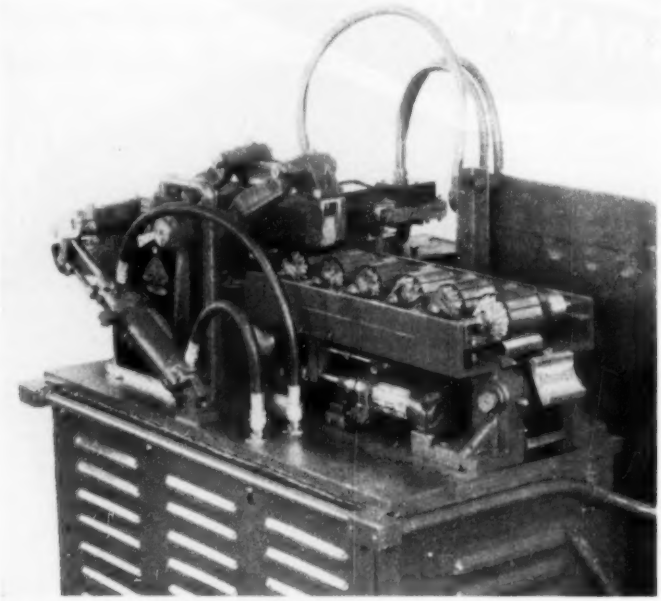


Redesigned 5-Ton Press is Sturdier, More Accurate

Di Machine Corp. has redesigned their 5-ton automatic press to embody the following features: The base encloses the motor, belt and pulley for sturdier, more modern appearance, and safer operation. Feed is of more rigid construction, easier to set, with spring tension evenly distributed for more accuracy and longer life. A heavier gear rack and simpler adjustment plate for more positive operation with less adjustment. A simpler and more dependable top-roller lifting mechanism of rugged design. Positive knockout for compound dies.

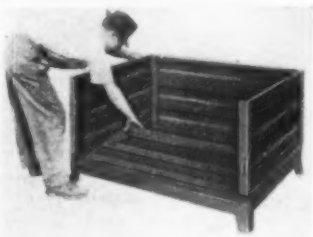
Di Machine Corp., 2711 W. Irving Park Road, Chicago 18, Ill.

(MORE DATA? CIRCLE FYI 53, p. 159)



INDEXING MACHINE mills mica slots on armatures for electric motors. Loading, feeding, positioning, and unloading mechanisms are operated by synchronized electric, magnetic, and pneumatic systems. As soon as a predetermined number of slots have been cut in each armature, it is automatically unloaded and loaded again as the conveyor positions the next piece—*Pri Kar Engineering Sales Co., Detroit, Mich.*

(MORE DATA? CIRCLE FYI 52, p. 159)



Materials-Handling Box Takes 75% Less Storage Space

A collapsible, 2000-lb-capacity materials-handling box, which may be erected in less than 20 sec, folds down to a height of 9 in. with a level top surface. It is claimed that these Philboxes can be stacked in 25% less space than erected storage boxes.

Construction is such that a fork-lift truck or pallet truck may enter from all four sides. Made of all-welded steel, the edges have been rolled as a safety feature.

Phillips Mine and Mill Supply Co., 2322 Jane St., Pittsburgh 3, Pa.

(MORE DATA? CIRCLE FYI 54, p. 159)

FYI

FOR YOUR INFORMATION

FREE details about new machines & tools
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FYI—these initials symbolize information that's important. We use them, too, to head our expanded reader service. Here are two postcards which will bring you new literature, bulletins on new equipment, materials or parts, further information from any advertiser, or advice from editors—for a 3-cent stamp.

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For details on an advertised product, write the page number in one of the boxes provided, adding the advertiser's initials if more than one advertisement appears on the page—If the page is unnumbered, as a cover or insert, or the ad shows several products, use initials and write in the product name. Fill in your name, title and address, cut out the card, add a 3-cent stamp and mail. We do the rest, saving you time, trouble and money. Use this card for requesting manufacturers' literature or more details on new equipment. →

NEW BULLETINS

MACHINES AND ATTACHMENTS

1 BROACHES—*Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio.* 12-page bulletin M-1706 covers vertical single- and double-ram broaching machines. Shop photos show machines doing typical operations.

2 AUTOMATIC DRILLER—*The Hartford Special Machinery Co., Hartford 5, Conn.* 8-page bulletin DM100 describes and illustrates a line of automatic drilling and tapping machines for special applications. Illustrations show products of these tailored machines.

3 CHUCKS—*Sundstrand Machine Tool Co., Rockford, Ill.* 16-page booklet demonstrates the application of the company's magnetic chucks for various machining work. Contains some good ideas on holding methods.

4 DIES—*Carboloy Co., Detroit 32, Mich.* 4-page bulletin D-127 gives detailed instructions for assembling and finishing header dies employing carbide die nibs. Includes a nomograph for the determination of press fit required for the assembly of the nibs in steel cases.

5 MANDRELS—*Western Tool & Manufacturing Co. Inc., Springfield, Ohio.* 9-page catalog describes the Champion line of mandrels, wheel dressers, steel racks, and C-clamps. Includes specifications and prices.

TOOLS AND ACCESSORIES

6 DRILLS—*Keller Tool Co., Grand Haven, Mich.* 36-page manual describes the components of the Airfoedrill, has a section on the care and selection of drill bits, and shows applications of the tool.

7 REAMERS—*Pratt & Whitney, West Hartford 1, Conn.* 4-page bulletin shows applications of Blue Helix reamers, gives design features, and includes specifications for either straight or tapered models.

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FYI
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FREE details about new machines & tools
FREE data on new materials or parts
FREE shop calculators and data sheets
FREE information from advertisers
FREE advice on metalworking problems

8 DRILL BUSHINGS—*Universal Engineering Co., Frankenmuth, Mich.* 16-page illustrated booklet contains general information and specifications on drill jig bushings, locating pins, rest buttons, lock screws, and clamps. Bushing and locating-pin installation instructions are included.

9 QUILLS—*The Dumore Co., Racine, Wisc.* 28-page booklet describes and illustrates a line of quills, tool-post grinders, flexible-shaft tools, drills, and handgrinders. Charts enable the user to select the proper combination of quill and grinder.

10 HONES—*Mid-West Abrasive Co., Owosso, Mich.* 4-page folder describes Micro X and Micro E abrasive hones. Includes section on how to select a hone.

11 CARE OF DRILLS—*Chicago-Latrobe, Chicago 10, Ill.* 22-page booklet covers the essential points of drill and reamer care, including the proper grinding of points, speeds and feeds, and the proper lubricants.

12 DISK GRINDING—*Grinding Wheel Institute, Greendale, Mass.* 20-page booklet jammed with information on the proper handling of grinding wheels. Topics covered include: methods of mounting, design of wheel, storage and handling of disks.

HEAT TREATING AND WELDING

13 DC WELDERS—*Westinghouse Electric Corp., Pittsburgh 30, Pa.* Bulletin DB26-100 describes 200-, 300-, and 400-amp, 60%-duty cycle, selenium-rectifier dc welders. Gives engineering information such as power costs, performance and construction details, dimensions and weights.

14 TANK HEATING—*Kold-Hold Mfg. Co., Lansing, Mich.* Bulletin covers a method of heating tanks employing a lightweight, embossed plate called a Platecoil. It is used to carry a heating solution, and is said to have a high Btu capacity per sq ft.

15 STUD WELDING—*Nelson Stud Welding Div., Morton Gregory Corp., Lorain, Ohio.* 16-page illustrated booklet reprints the chapter on stud welding from the third edition of the Welding Handbook. The article explains the stud-welding method of fastening, describes equipment, gives locating procedures, and other data.

PLANT SERVICE EQUIPMENT

16 AIR CYLINDERS—*Logansport Machine Co., Logansport, Ind.* 14-page catalog 100 describes a line of stationary and rotating air cylinders, and air-operated vises. Specifications and detail drawings accompany each model.

17 OVERHEAD CRANES—*Northern Engineering Works, Detroit 7, Mich.* 8-page booklet shows Hi-Lift cranes in service, and describes crane components.

18 POWER PUMPS—*John Bean Div., Food Machinery and Chemical Corp., Lansing 4, Mich.* 30-page catalog has information and specifications on power pumps and accessories, and spray guns with accessories. Cutaway views show construction.

19 FIELD REPORT ON MATERIAL-FLOW EQUIPMENT — *Rapids-Standard Co., Inc., Grand Rapids 2, Mich.* 4-page pamphlet reports on the methods used in industry to handle specific problems in materials handling.

20 LIFT TRUCKS—*Lift Trucks Inc., Cincinnati 14, Ohio.*—4-page pamphlet gives specifications and features of Red Arrow lift trucks.

PARTS AND MATERIALS

21 BOSTON GEAR CATALOG NO. 5 —*Boston Gear Works, 60 Hayward St., Quincy 71, Mass.* 384-page catalog contains information on new stock items together with application, selection and reference data that has not appeared in previous editions. It lists over 100 product groups, and provides much engineering data.

22 CAST STEELS—*Jessop Steel Co., Washington, Pa.* 14-page manual illustrates and describes cast-to-shape steels such as air-hardening tool, hot work, and stainless. Heat-treating instructions are included.

23 PLASTICS — *Formica Co., Cincinnati 32, Ohio* — 16-page catalog covers the applications of laminated thermosetting plastics for various industries. A comparator chart shows the significant properties of over 50 standard grades.

24 MOTORS—*Arma Corp., Brooklyn 32, N. Y.* 16-page bulletin describes 15 induction motors and generators for instrumentation and control work.

25 AIR-CONTROL VALVES—*Logansport Machine Co., Inc., Logansport, Ind.* 44-page catalog 100 Sec. 4 illustrates and describes a full line of air-control valves. Specifications are included.

26 SPEED REDUCERS — *The Falk Corp., Milwaukee 8, Wis.* 16-page booklet covers subjects such as method of selection, horsepower rating and torque-capacity tables, dimensions and specifications.

27 AIR PUMPS—*Leimon Bros., Inc., Newark 5, N. J.* 16-page catalogue 450 contains performance curves and specifications on 4-wing and 2-wing air pumps.

MISCELLANEOUS

28 CARBIDE - GRADE CHART — *Wendt-Sonis Co., Hannibal, Mo.* 2-color chart outlines the carbide-grade recommendations of nine principal carbide manufacturers for chip-removal, impact, and wear applications.

29 WATER CONSULTING SERVICE—*Hall Laboratories, Inc., Pittsburgh, Pa.* 4-page booklet describes industrial-water engineering services offered for water procurement, treatment, usage, and disposal.

30 RUBBER FORMS — *Continental Rubber Works, Erie, Pa.* 8-page catalog contains illustrations and specifications on standard grommets, bushings, bumpers, O-rings, and numerous extruded shapes.

YOU MIGHT SAVE MONEY BY FAST INSPECTION OF INTERNAL THREADS. Alert management is using Bryant Thread Gages and operational control in their threading departments to: 1) catch mistakes as they are made; 2) place responsibility fairly on operator, tools or machines; 3) provide a statistical record of regularly sampled parts showing the status and trend of the operation at all times.

The unique Bryant Thread Gages give a visual quantitative reading of accuracy within tolerances, or accumulative inaccuracies of lead, pitch diameter and thread form, or the presence of burrs. The Bryant squareness-of-face attachment shows relationship of face to pitch diameter.

One company, using Bryant Gages, proved that a sizable investment in new machines was unnecessary, and, most important, improved the accuracy and production of their threaded parts.

Let us show you, with facts and figures, how much money Bryant Gages can save you in just one year. It won't cost to inquire!

BRYANT

CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U.S.A.

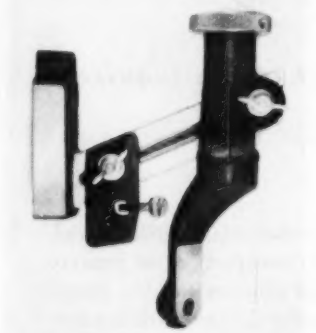
Air Pump Removes Corrosive Liquids Safely

A safer, more economical, and faster way to remove acids and other corrosive liquids from stainless-steel containers is said to be offered by this air pump. Liquids flow smoothly, stop instantly, and only contact corrosion-resistant tubing.

Known as GS No. 17, the pump has a safety pressure valve, a hold-down clamp to secure the pump to the container, and 25 ft of air hose with couplings. Price—$27.56.

General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa.

(MORE DATA? CIRCLE FYI 55, p 159)



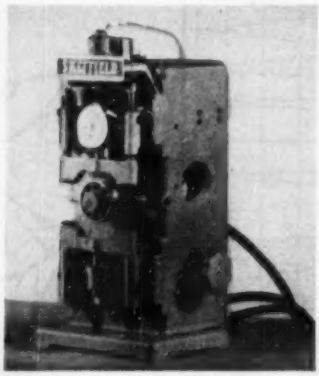
Grinding-Wheel Dresser Moves Diamond Point to Wheel

One of the important advantages claimed for this three-way dresser is that it saves time and operator fatigue by taking the diamond point to the wheel instead of raising or lowering the wheel to the dresser. A radius arm will dress either concave or convex radii. A second diamond holder is used for straight or angle dressing. All holes for diamond points are 7/16-in. ID.

The dresser is available with either a magnetic or standard base. The magnetic base has a release lever for breaking magnetic attraction. The standard base is used for sliding the dresser to the wheel. Either base can be purchased with or without the radius arm.

Detroit Industrial Products Co., 15244 Aubrey, Detroit 23, Mich.

(MORE DATA? CIRCLE FYI 56, p 159)



Ball-Bearing Gage Measures Radial Internal Clearance

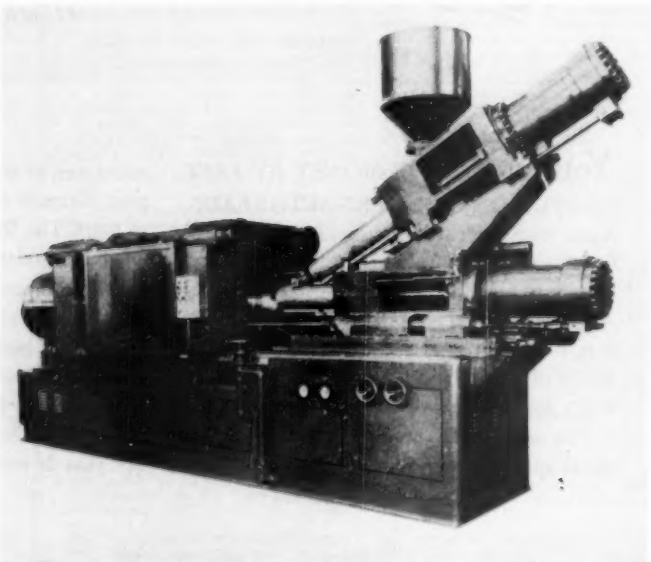
Radial internal clearance of ball and roller bearings can be accurately measured on a production basis by a gaging instrument recently developed. Readings are direct, and are positively repetitive.

The bearing is placed onto a horizontal arbor of a size corresponding to the internal diameter of the inner ring, with the other ring floating both axially and radially. Two operations of a pedal cause the bearing to be loaded successively upward and downward. Movements of the outer ring are shown on a tenth dial and the difference between the two readings represents the amount of radial play. The instrument is said to be the only one in which balls are positively positioned at the bottom of the grooves, and with the races in proper relation to each other during the measurement. This "shakedown" into position is accomplished by vibrators operating automatically for a brief adjustable cycle as the load is being applied.

The indicator is mounted on a ball slide having a pressure arm extending along a slot at the top of the arbor. Measurement is not affected by wear on the arbor. Upper and lower measuring load members are easily adjusted vertically to accommodate bearings having internal diameters ranging from 3.2 mm. to 50 mm. inclusive, or a maximum of 5-in. outside diameter of outer ring.

Sheffield Corp., Dayton 1, Ohio

(MORE DATA? CIRCLE FYI 57, p 159)



INJECTION MOLDING MACHINE with 21,000-psi nozzle pressure is said to be the world's largest. It is capable of pressing out at one time plastic products approximately 200 oz. in weight. Television and radio cabinets, refrigerator-door linings, kitchen-cabinet doors, and many other large-sized products can be molded in one piece. Clamping capacity is 1000 tons and daylight opening 54 in.

—Watson-Stillman Co., Roselle, N. J. (MORE DATA? CIRCLE FYI 58, p 159)

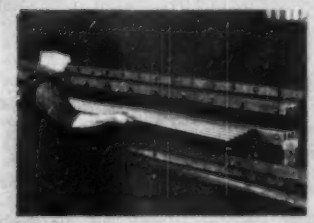
WHERE PLATE IS WELDED

A STEELWELD IS NEEDED . . .

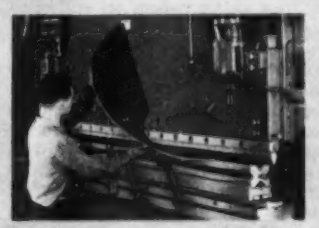
Whether you make boilers, furniture, railroad cars, ships, airplanes or machinery, if you work with metal from 12 gauge to one inch thick, most likely you have great need for a Steelweld Bending Press.

Steelwelds are versatile tools that perform many types of work quickly and easily, whether only one piece or a production run is required. Long, sharp welded corners can be replaced by quickly made, smooth, round, bended ones, and both appearance and strength improved. Illustrated below are some of the many kinds of work that can be performed on any Steelweld.

It will pay you to investigate the many possibilities of this modern metal-forming tool that is improving product appearance and saving time and money for many enthusiastic users.



Corrugating and any straight-line production bending can be done to hairline accuracy.



Conical sections are quickly formed with standard bending dies by use of the ram-tapering mechanism.

Large diameter holes can be punched singly. Bolt holes and other holes can be punched 25 to 150 at a time.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1413 EAST 281st STREET • WICKLIFFE, OHIO

STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

Miller for Fast Machining of Straight or Spiral Flutes

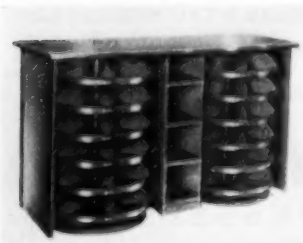
Hydraulic automatic flute miller has been designed for fast, accurate milling of spiral and straight flutes. The spindle is fitted in a housing, which is mounted on a cross-slide swivel base on top of the vertical slide. The housing can be swiveled to any angle up to 45° for spiral fluting. The spindle is driven through a double V-belt by 1½-hp. Lima motor drive, having four speeds.

The spindle is mounted in a quill on double rows of anti-friction bearings, with provision for expansion. It has a No. 9 B&S taper hole, so that milling cutter arbors on end mills can be used.

The table has a 9-in. travel and is automatically operated by a hydraulic motor dog controlled at each end of the stroke. It feeds from 1½ to 30 ipm with rapid traverse on the return stroke.

It machines taps, reamers, counterbores, or any small cutting tool from 1⅛- to 4-in. diameter; spacing from 2 to 40 flutes.

Wardwell Mfg. Co., 5167 Fulton Rd., Cleveland 9, Ohio
(MORE DATA? CIRCLE FYI 59, p. 159)



Storage Counter Has Twelve Rotating Trays

F-G-M Rotabin Counter provides aisle access to 72 large compartments in twelve 28-in. diameter independently rotating trays. Four stationary spaces are available for larger items.

The counter is built of steel, the top formed from a single heavy-gage sheet. Center-shelf section is bolted in place. Over-all dimensions are 6 ft. 3 in. long, by 27 in. deep, by 41 in. high. Finish is olive-green enamel, baked on.

The Frick-Gallagher Mfg. Co., 250 S. Broad Street, Philadelphia 2, Pa.
(MORE DATA? CIRCLE FYI 60, p. 159)

Dust respirator can be used for all known toxic dusts which are not significantly more toxic than lead. Carrying approval of the U. S. Bureau of Mines for Lead Dusts, the respirator is light and compact, using a single chemically treated filter, 3 1/16 in. in diameter. All metal parts are made of aluminum, permitting the face piece to be bent inward or outward to fit any facial contour.

Pulmosan Safety Equipment Corp., 644 Pacific St., Brooklyn 17, N.Y.
(MORE DATA? CIRCLE FYI 61, p. 159)

Allis-Chalmers Magic-Grip sheave line has been extended to include A-B combination groove sheaves in sizes from 3 to 38 in. with 1 to 6 grooves in both collar and no-collar models. Both types operate on the principle of clamping the sheave firmly to the shaft by compressing a split, tapered, bushing sleeve. The non-collar bushing has radially adjusted setscrews and is designed to allow maximum bores in the smaller pitch diameters.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
(MORE DATA? CIRCLE FYI 62, p. 159)

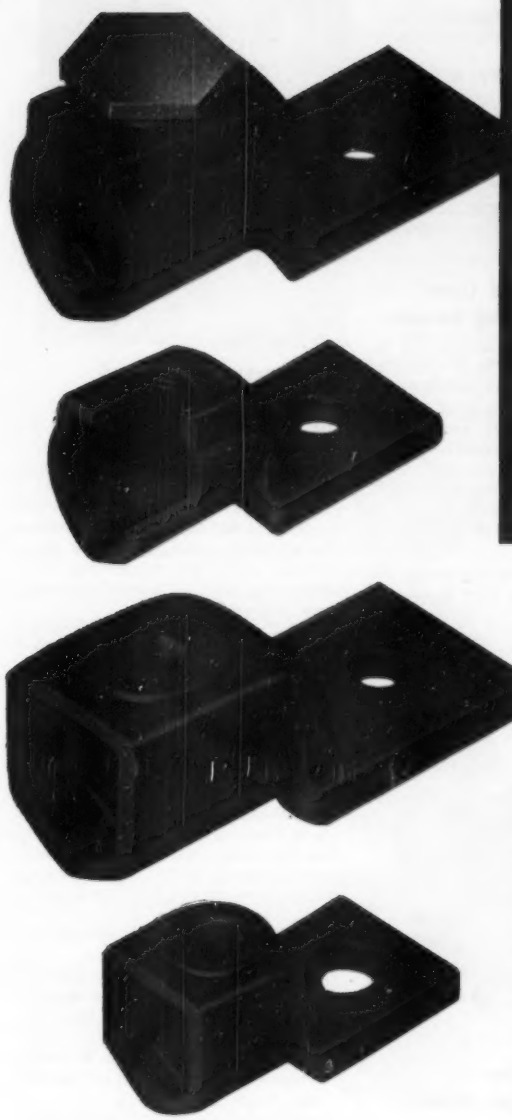
Spur curve has been developed for use in Rapistan gravity conveyor systems which automatically stops material cases. It regulates the flow of goods from two converging conveyor lines, eliminating the hand transfer of case stops when changing flow from one line to another. Raising a lever elevates an auto-block in the curve section, while automatically lowering one in the straight portion of the spur curve.

Rapids-Standard Co., Inc., 342 Rapistan Bldg., Grand Rapids 2, Mich.
(MORE DATA? CIRCLE FYI 63, p. 159)

All-purpose cutting electrode cuts, pierces, gouges, chamfers or removes welds without the use of oxygen or special equipment. It works from welding machines of either the motor-generator or ac-transformer type.

According to the manufacturer, fast cutting and easy control is attained by a heat-resistant coating that concentrates the arc at the tip; the coating burning off at an even rate with the metallic core.

All-State Welding Alloys Co. Inc., 273 Ferris Ave., White Plains, N.Y.
(MORE DATA? CIRCLE FYI 64, p. 159)



Overwork makes these lugs Stronger...

. . . they're fabricated from Revere Seamless Copper Tube

WHEN Ilsco Copper Tube & Products, Inc., Cincinnati, Ohio, first designed their new type electrical wire connectors, they insisted that the product requirements, which were rigid to begin with, not only be met, but exceeded.

These requirements included mechanical strength, adequate electrical conductivity and uniformity, plus ease of application and long life with no season cracking. So it wasn't easy to find a material that would fill the bill. Because of favorable past experience, Ilsco tried a certain type of Revere Seamless Copper Tube. They gave it the complete cold-working treatment: forming, sawing, drawing, shaping, separating, expanding, tapping, reducing, and piercing. They not only came up with a connector without distortion, but one that, because of its one-piece seamless construction, had the additional strength necessary to withstand Underwriter's Laboratories tests for secureness and the hard usage and abuse the connectors would receive in the field.

The use of Revere Seamless Copper Tube resulted in finished connectors with a smooth, even, bright finish . . . no pitting . . . produced connectors that average over 50% cooler in operation than the maximum allowed by Underwriter's Laboratories.

Perhaps Revere can be of help in improving or developing your product . . . cutting your production costs. Why not tell Revere about your metal problems? Call the Revere Sales Office nearest you today.

SHOWN ABOVE are a few of the various styles and sizes of ILSCO Connectors. All are drawn and formed from Revere Seamless Copper Tube. They have 100% electrical conductivity, permitting a more compact unit, with a wide wire range for each size. However, only 6 sizes provide for the entire wire range from # 6 to 600 MCM.

NOTE CUTAWAY VIEW of the connector second from top. See how the one-piece seamless construction permits deep extrusion with a greater number of threads. In spite of their husky construction, these lugs are from 3 to 6 times lighter in weight than cast types of equal carrying capacity

REVERE

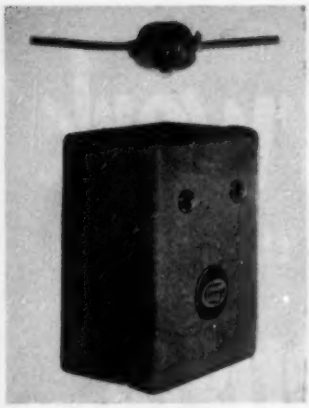
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere



Photoelectric Principle Used to "See" Fire

This fire-protection system makes use of the photoelectric principle to detect fires. It is designed to ignore sunlight, artificial illumination, or other extraneous light of any intensity. The system, known as Fireye FD-10, consists of six detectors and one control panel, providing coverage up to 120 x 80 ft, since each detector will monitor an area within a radius of 20 ft. A part of the system is the self-monitoring feature which provides assurance that the equipment is operating and in readiness to detect fire.

An electrical impulse of sufficiently low intensity to prevent a fire-alarm indication is continuously applied to all circuits. Loss of this signal from any wiring or component failure will actuate a relay to give a distinctive trouble warning. The detectors are arranged in a series circuit for wiring simplicity, and mount directly on any standard 3-in. outlet box.

Fireye Corp., 77 Broadway, Cambridge 42, Mass.

(MORE DATA? CIRCLE FYI 65, p 159)

Synthetic-Rubber Insert Part of Flexible Coupling

A flexible coupling that employs a rubber insert is another method of licking the misalignment problem in shafts. The metal jaws are manufactured to close tolerances, and the insert is of oil-resistant synthetic rubber.

Available for shafts from ½ to 1⅝ in., at horsepower ranges from fractional to 25. Standard keyways are provided.

Gerbing Mfg. Corp., Roto Cone Variable Speed Pulley Div., Northbrook, Ill.

(MORE DATA? CIRCLE FYI 66, p 159)

Light-Weight Ground Clamp For 300-Amp Welding Currents

This welding clamp weighs 1½ lb, has a jaw spread of 2½ in. and is to be used on jobs where welding currents do not average over 300 amps. It is of pressed-steel construction and has a heavy direct-acting spring to apply clamping pressure. The jaws are made of a steel and copper alloy, Lincalloy, which is said to be both highly conductive and highly resistant to wear.

Lincoln Electric Co., Cleveland, Ohio

(MORE DATA? CIRCLE FYI 67, p 159)

Mobile Tool Cabinet Has Interchangeable Drawers

A buyer may custom-build his own cabinet in these units because the runners permit any of three basic sizes of drawers to be installed in any combination. The cabinet is constructed of heavy-gage welded steel, and critical points are reinforced.

Roller slots keep the drawers from easily opening when the cabinet is moved. Rubber 5-in casters are used, two of them having pedal brakes.

Plomb Tool Co., Los Angeles, Calif.

(MORE DATA? CIRCLE FYI 68, p 159)

Air Compressor in Drillhead Automatically Advances Tool

The Dumore drillhead employs a motor having a double-end armature shaft. A No. 0 precision Jacobs chuck is on one end and a rotary vane compressor on the other; the entire assembly operating as a unit. The motor supplies the power for drilling, while the compressor advances the drill at pre-determined speed and pressure.

Speed of the motor is controlled by the load of the rotary-vane compressor which acts as a speed governor. Thus, the drillhead operates at usable work speeds varying from 2500 to 7500 rpm, depending upon the pressure exerted on the drill by adjusting air pressure and the feed regulator.

Depth of stroke ranges from 1/32 to 1⅛ in. and can be selected by adjustable stop nuts in the head. Depth can be controlled to within 0.004 in. Forward movement of the drill is slowed at the breakthrough point by increasing pressure of the spring return.

For drilling holes greater than 5 drill diameters in depth, or where chip clogging is apt to occur, the unit can be operated manually. Units cost less than $200 each and can be used for ferrous or non-ferrous materials.

Dumore Co., Racine, Wis.

(MORE DATA? CIRCLE FYI 69, p 159)

Sharpening stones have had a beauty treatment in the form of a packaging that combines attractiveness with utility. Stock handling is simplified by color identification of the brands, and line identification by the wrapper design. Metal-strip reinforcements at the corners prevent damage.

Behr-Manning Div. of Norton Co., Troy, N. Y.

(MORE DATA? CIRCLE FYI 70, p 159)

Century 1 TO 400 H.P. MOTORS

Choose From These Many Types To Fit Your Job

DEPENDABLE CONSTRUCTION . . . Plus

PROPER SELECTION MINIMIZE SHUTDOWNS

It's easy to select the proper electric motor for your job from Century's complete line — from 1/6 to 400 horsepower. A wide range of types and kinds are available to satisfy all popular requirements. They are carefully designed, built and tested to assure maximum performance throughout their long life.

Here are examples of Century's line of INTEGRAL HORSEPOWER motors.

Polyphase

TYPE SC—Open Drip proof General Purpose Motor. Meets the needs of most installations where operating conditions are relatively clean and dry.

TYPE SC—Splash proof. Supplies protection where plants must be washed down. Keeps out all falling or splashing liquids—rain, snow, sleet, etc.

TYPE SC—Totally Enclosed Fan Cooled. Protects against dusts, mist, oil, fog. Inner frame protects vital parts of the motor, seals out harmful matter.

TYPE SC—Explosion proof. Protects life and property in atmospheres charged with explosive dusts or gases.

TYPE SR—Wound Rotor. Open Construction. Ideal for applications requiring low starting current with high starting torque, reversing or adjustable speed.

TYPE SR—Wound Rotor Splash proof. Same electrical characteristics as motor shown above. In addition, gives adequate protection against falling and splashing liquids.

Single Phase

TYPE RS—Repulsion Start Induction, Open Construction, Single Phase Brush Lifting Motor. Combines high starting torque with low starting current.

TYPE RS—Splash proof. Same advantages as open construction, plus protection against splashing and falling liquids.

TYPE CSH—Capacitor Start Induction, Single Phase Motor. Suitable when high starting torque with normal starting current is satisfactory.

TYPE CSH—Splash proof. Same advantages as motor shown above, plus protection against falling and splashing liquids.

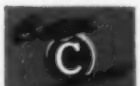
Direct Current

TYPE DN—Direct Current Motors. Suitable for use where direct current is available, or its use desirable.

TYPE DN—Direct Current, Splash proof.

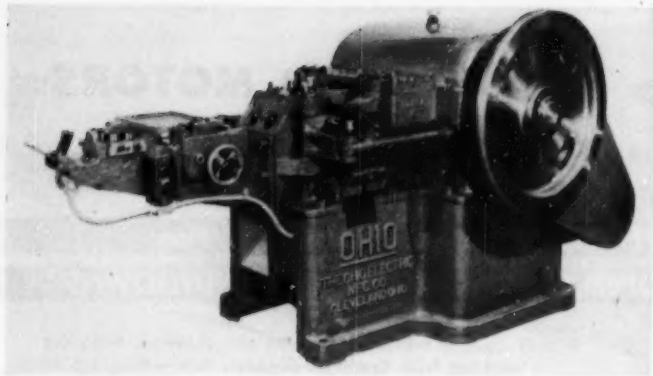
TYPE SY—Synchronous. Suitable for continuous operation at a uniform load for power factor correction.

In addition to a complete line of integral horsepower motors, Century offers fractional horsepower motors, gear motors, generators, AC and DC motor generator sets.



For a long life of satisfactory performance, specify Century motors for all your electric power requirements.

CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri • Offices and Stock Points in Principal Cities



Nail Machine Permits Length Change While Operating

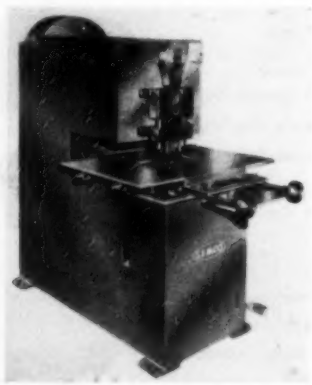
An adjustable-fulcrum feeder linkage permits the operator to change the length of the nail produced while this machine is operating. Other features are a two-plane wire straightener, automatic-cutoff switch that stops the machine when the wire runs out or snarls, interchangeable cutoff dies, and adjustable header tool to produce nail heads of different diameters and thicknesses.

All parts in the crank housing are lubricated by pressure or spray supplied from an 8-gal. oil sump. Cutter slides are grease lubricated and have individual reservoirs holding a supply of lubricant for an 8-hour production run. Crankshaft bearings have a 6 to 1 factor of safety, and are designed for 30,000 hr. of life.

The nail machines are offered in a variety of sizes from the small model AA for producing wire brads up to model JA for making $\frac{3}{8}$x12-in. spikes.

Black Nail Machine Div., The Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland 4, Ohio

(MORE DATA? CIRCLE FYI 71, p. 159)



Nibbler-Press Punching Speed Increased 15%

Two hundred and sixty strokes per minute instead of 210, speeds up hole, slot or notch punching speed of the Semco nibbler press by as much as 15%, according to manufacturers. Sheets, strips, or plates up to $\frac{1}{8}$ in. thick can be punched with any shape of hole up to 12 in. in size at a single setting.

Duplications of punched holes, slots or notches, is positive, because punching is controlled by templet. They may be of any sheet metal, stiff enough to confine the follower pin. The ratio of templet to actual work is 1 to 1 and the largest blank of 17 x 6 in. is dropped over two studs. With the exact size and shape of hole, slot or notch cut in the templet, a follower pin confines the movement of the worktable within the prepared area as the operator guides the punching with two hand knobs. One is for backward and forward, and the other for left to right movement of the worktable.

Throat depth is 20 in. with $4\frac{3}{4}$-in. clearance. Stroke is $1\frac{1}{2}$ in. Maximum shut height $3\frac{3}{4}$ in. and minimum $2\frac{3}{4}$ in. Power is provided by a one-horsepower motor which drives through a 73-lb. flywheel. Press weight is 2100 lb.

Service Machine Co., 826 Miller St., Elizabeth 4, N. J.

(MORE DATA? CIRCLE FYI 72, p. 159)

Sling-Chain Adjuster Handles Unbalanced Loads

Acco sling-chain adjuster permits the lifting of an object at any angle desired. By shifting the chain in the pocket wheel, one leg is made longer and the other leg shorter. Under tension the chain locks and the load cannot shift.

Unbalanced loads, or loads hard to handle can be safely transported using this adjustment, eliminating the necessity of twisting or spiking a leg of the chain to shorten it—a practice that may be dangerous.

The adjuster is only available in complete units of pear-shaped link, adjuster, and sling chain with hooks on both ends.

American Chain Div., American Chain & Cable Co., Inc., York, Pa.

(MORE DATA? CIRCLE FYI 73, p. 159)

Tamper-proof soap dispenser has a baffle plate at the top making it impossible for workers to force open the lid in order to scoop out handfuls of compound. Modern in appearance, the dispenser can be quickly refilled and maintained.

Turko Products Inc., 6135 South Central Ave., Los Angeles 1, Calif.

(MORE DATA? CIRCLE FYI 74, p. 159)

Safety switches are available in 100- and 200-amp. sizes. Current-carrying parts of the switches are silver-plated, and blades are easily visible for quick checking of switch operation. Line terminals are dead-front, protected by a hinged arc chamber.

Square D Co., 6060 Rivard St., Detroit 11, Mich.

(MORE DATA? CIRCLE FYI 75, p. 159)

Flame-resistant hydraulic fluid is said to have high lubricity, and to be a non-conductor of electricity. Because the fluid is an ester-base compound, containing no halogenated hydrocarbons, salts or water, it is claimed it will not corrode bearings or other metal parts.

Monsanto Chemical Co., St. Louis 4, Mo.

(MORE DATA? CIRCLE FYI 76, p. 159)

POP'S school of Filing

LOOK AT "FALSE ECONOMY" JAKE KILLIN' HISSELF WITH WORN-OUT FILES.... AND WASTIN' TIME WORTH MORE'N TEN TIMES THE COST OF NEW ONES!
HE HASN'T BEEN TO THE CRIB FOR FRESH FILES SINCE V-DAY!
HE AIN'T IMPRESSIN' POP. POP'S GOT HIS NUMBER — IT'S DOUBLE-O MINUS!
JAKE'S FORESIGHT IS 'BOUT AS LONG AS A SHORT PIECE O' STRING!
STAN RANDALL

LIKE many other good shop foremen, Pop has made file life a factor in his figuring of production costs. Because: being, by nature, a "wear-away" tool, there is definitely a turning point in a file's productivity—where the cost of a fresh file is less than the cost of the time and efficiency the old file wastes.

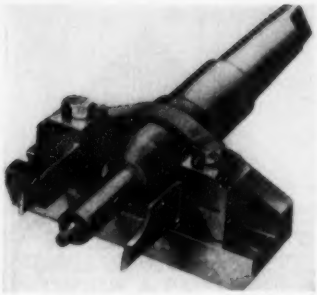
An important step is to choose files that go farthest before reaching the turning point toward unprofitable production. It can be determined by tests and general experience. Nicholson and Black Diamond brands welcome such tests. You can make them yourself. Or, you can safely take the word of this 86-year-old file manufacturing concern, which is continually making tests and never permitting itself to lag in giving you the very utmost for your file dollars.

Nicholson and Black Diamond files are sold through reliable distributors everywhere

FREE BOOK, *"FILE FILOSOPHY."* Most widely used book of its kind . . . 48 illustrated pages on kinds, use and care of files. Every production and purchasing head should have a copy. Write for it.

NICHOLSON FILE CO. • 29 ACORN STREET • PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

NICHOLSON ... A FILE FOR EVERY PURPOSE



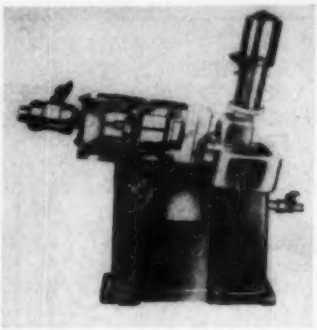
Sturdy Flycutter is Used With Drills, Lathes

This boring tool is claimed to be capable of boring a 5-in. hole in one-in. boiler plate in 80 sec. Called the Boremaster, it consists basically of two adjustable knives, available in high-speed steel or tungsten carbide, held in a rigid clamp on a heavy spindle. The tool is of sturdy construction, and can be used with radial drills, other heavy drills, lathes, and turret machines. Holes 1 9/16 to 11¾-in. in diameter can be bored to a depth of 4 in.

Waste of material is cut to a minimum by the Boremaster, as stock is removed in the form of a solid circular block, with only a guide hole, about ¼ in. in diameter and ¼ in. in depth, in the center. This core is therefore suitable for use in the production of smaller parts.

Karl A. Neise, 381 Fourth Ave., New York 16, N. Y.

(MORE DATA? CIRCLE FYI 77, p 159)



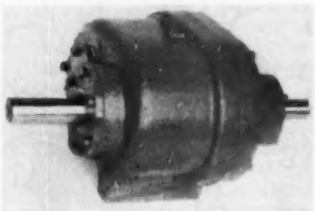
One-Lb Die-Casting Machine Does "On the Spot" Work

A small air-operated die-casting machine with automatic metal injection and automatic opening and closing has been developed. The machine is designed to enable manufacturers to do die-casting of small metal parts in their own shops.

The machine has a 1-lb capacity, utilizing die blocks up to 2½ in. in thickness and as large as 9 x 9 in. Production speeds have been upped to an average of 600 to 800 shots per hour. The die blocks supplied with the machine are completely prefabricated and contain everything except the actual cavities, which can be machined directly into the blocks. Single-cavity molds are sufficient because of the high speeds. A heavy four-corner toggle lock absorbs shot pressure and insures relatively flash-free castings.

DCMT Die Casting Machine Corp., 16½ Duane St., New York 13, N. Y.

(MORE DATA? CIRCLE FYI 80, p 159)



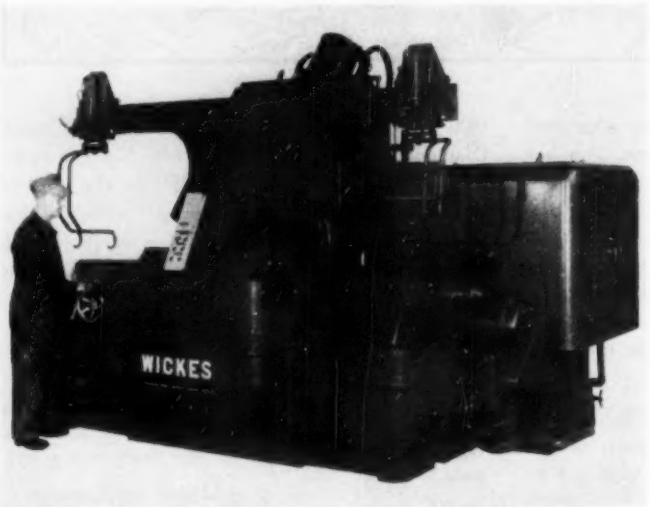
Automatic Transmission has Two Over-Running Clutches

The mechanism in this Western two-speed automatic transmission consists of two over-running clutches, one engaging in a clockwise, the other in a counter-clockwise direction. They are arranged so that by reversing the motor, two speeds are provided, one at direct motor speed and the other at a pre-selected reduction, without changing direction of rotation of the output shaft.

Motor controls are accomplished by means of a pushbutton, limit or timing switch, or other electrical means. The low limit of reduction is 6 to 1, but any pre-selected ratio from direct motor speed to this low limit is obtainable. It has a 20-hp capacity with minimum input speed of 900 rpm.

Western Mfg. Co., 3900 Scotten Ave., Detroit 10, Mich.

(MORE DATA? CIRCLE FYI 81, p 159)



CENTER-DRIVE AUTOMATIC LATHE is designed for rough and finish turning of all crankshaft main-line bearings and ends. It uses three sets of cross-slides which surround the crankshaft with cutting tools. Front and rear cross-slides carry the rough-turning tools and divide the tool load on the crankshaft during the checking, rough turning, and filleting operations. A third slide, which extends from spindle to spindle, approaches the crankshaft from the top with finishing tools. Production on one type of crankshaft was 35 per hr, using two of the lathes. —*Wickes Brothers, Saginaw, Mich.* (MORE DATA? CIRCLE FYI 79, p 159)

Electric switch is designed to automatically shut off electric equipment in the event of a severe explosion or earth shock. The switch is set into the existing electrical system and will instantly cut off pumps handling dangerous materials, cut off machinery which would be damaged by continuing to operate, sound an alarm, and provide other safety measures.

McRae Valve Corp., 620 S. Main St., Los Angeles 14, Calif.

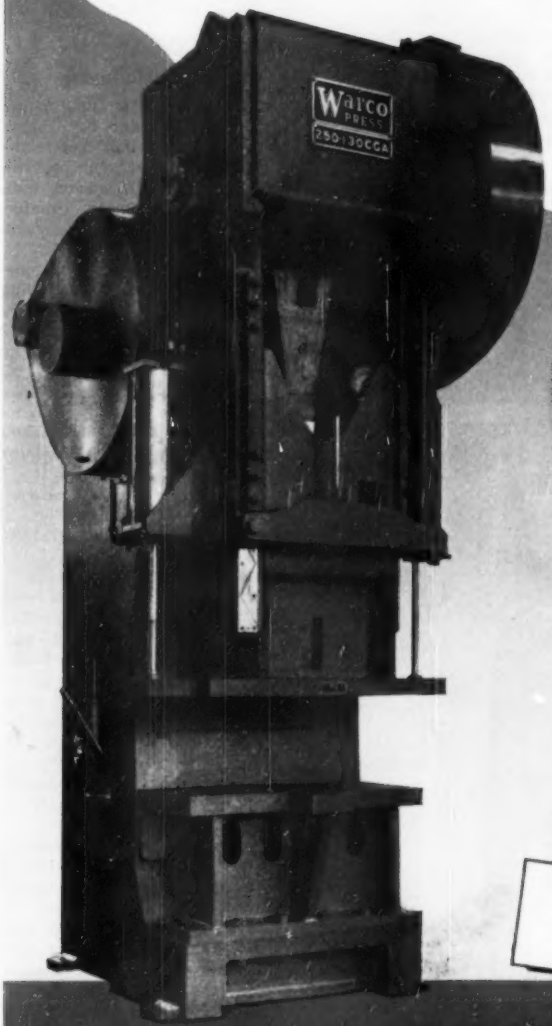
(MORE DATA? CIRCLE FYI 82, p 159)

IF YOU ARE THINKING OF

PRESSES—

THINK OF

Warco PRESSES®



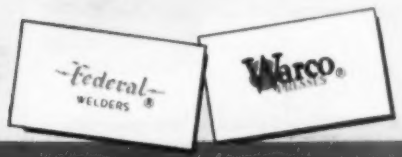
For Speedy, Dependable Low Cost Production

ALL Warco Presses are of welded steel construction which gives them unmatched flexibility for special press requirements.

For example, the 250-ton capacity gap press, pictured here, designed and built by Warco for one of America's largest automotive companies, features an adjustable bed with special replaceable knee to hold dies. Note, too, the long gibways on the slide to accommodate the long stroke and adjustment.

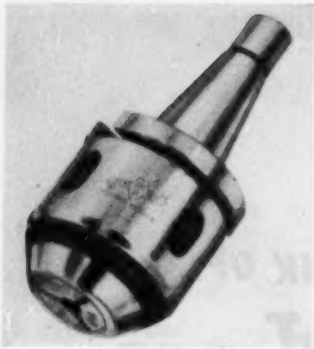
The press is double back geared and equipped with Warco pneumatic friction clutch and spring loaded brake.

If you're thinking of presses it will pay you to get in touch with the nearest Warco or Federal representative. Offices in principal cities.



THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO



Milling-Machine Chuck Has Bayonet Locking Nut

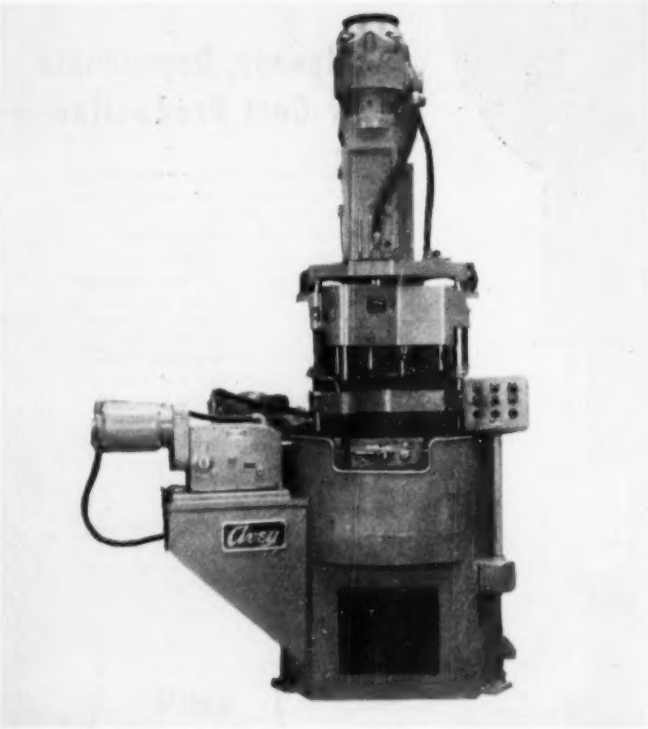
The bayonet locking nut in the Johansson chuck is claimed to make mill shanks run true because the chuck nut is given a much closer fit in the chuck body than would be expected with most threaded parts.

Made of alloyed Swedish steel, hardened and ground, all working surfaces are precision finished. The chucks are fastened to the machine spindle either by a pullrod or by four bolts. Locking grip of the chuck is of such power that end mills up to 5 in. in diameter can be driven on heavy cuts. On light cuts still larger mills may be used. Changing of tools is said to be accomplished with less than one-half turn of the locknut.

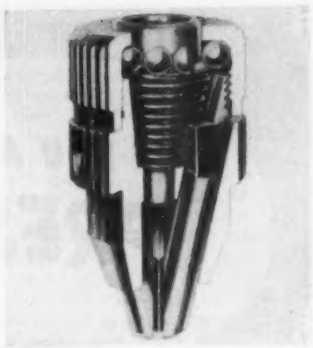
Chucks are available in five sizes, the larger chucks with shanks fitting Morse, Brown and Sharpe or the American Standard taper. Smaller chucks are made with straight shanks and used as inserting tools for the larger chucks. The chucks take shanks from ⅛ to 1½ in.

Eric S. Johnson Co., 230 East Ohio St., Chicago 11, Ill.

(MORE DATA? CIRCLE FYI 83, p. 159)



AUTOMATIC-INDEXING DRILLER is arranged with a cam-feed unit mounted vertically on a steel fabricated adapter column and base, and drives a six-spindle oil-circulating drillhead. Index table is arranged with five sets of double-acting fixtures. All drilling units are accurately aligned to the fixture at each stroke by hardened and ground locating pins. Cam-feed units are positioned at stations 2 and 3 on horizontal adapters. The machine performs various drilling operations on the body-end part of automotive automatic transmissions.—*Avey Drilling Machine Co., Inc., Cincinnati 1, Ohio* (MORE DATA? CIRCLE FYI 84, p. 159)



Keyless Drill Chuck Tightens During Machining

A keyless ball-bearing drill chuck is merely inserted and hand tightened. Machining action centers the tool and tightens the grip, preventing slippage. It is used on tools such as drills, reamers, counterbores, end mills, or any type shank tool.

Simple design consists of a cone-shaped screw directly actuating three gripping jaws. The jaws are keyed in the body in such a way that the screw does not take the jaw torsional strain.

The chuck is available in four sizes with chuck capacity ranging from 0 to ⅝ in. All types are stocked to fit any tapered or threaded spindle.

Ettco Tool Co. Inc., 549 Johnson Ave., Brooklyn 6, N. Y.

(MORE DATA? CIRCLE FYI 85, p. 159)

Alloy-steel castings of 12% chromium content have been developed for valve bodies, fittings, and similar parts required to withstand high pressures and corrosion. At present the alloy is being mainly used in gas-condensate wells. It is said to be the outgrowth of intensive cooperative research extending over a period of more than seven years.

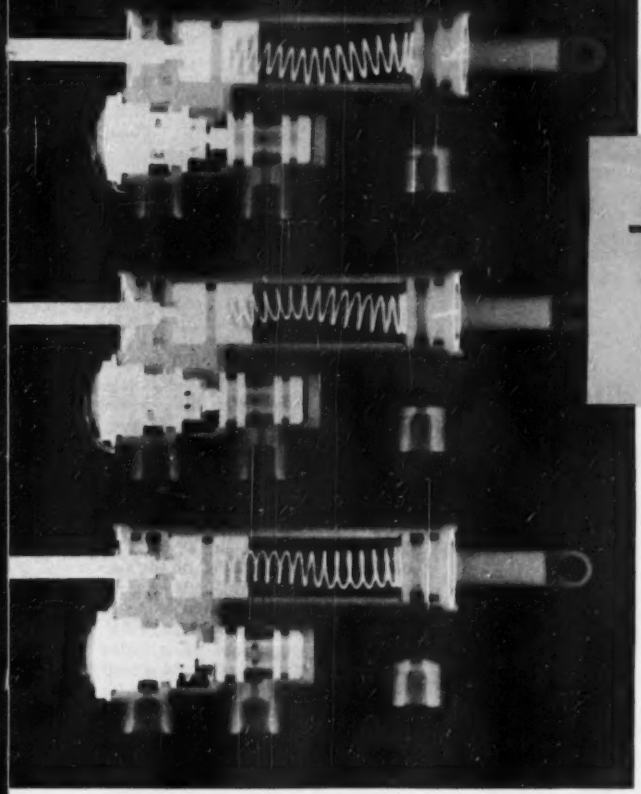
Lebanon Steel Foundry, Lebanon, Pa.

(MORE DATA? CIRCLE FYI 86, p. 159)

Highly concentrated non-corrosive lubricant for diesel guide pins is claimed to have excellent cleaning qualities. It is further said that 75% more strokes of dieset may be had per application of this lubricant than conventional lubricants. CMD anti-scoring lubricant is packaged in two consistencies, one liquid and the other in a No. 3 grease consistency.

Chicago Mfg. and Distributing Co., 1928 W. 46th St., Dept. AMP, Chicago 9, Ill.

(MORE DATA? CIRCLE FYI 87, p. 159)

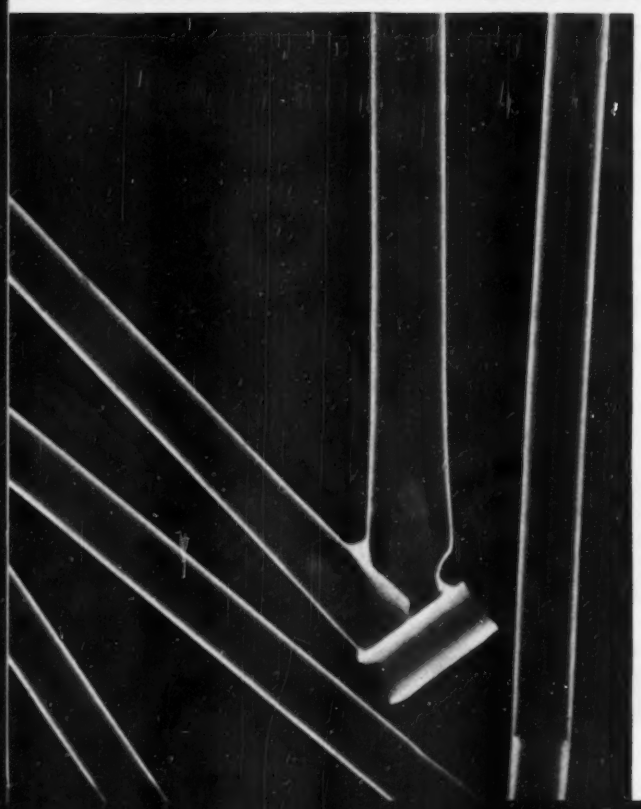


RADIOGRAPHY

goes beyond inspection of castings and welds

CHECKS ASSEMBLIES

Two of a group of hydraulic cylinders failed to function. Disassembly would have taken too long and involved breaking seals. Radiography compared the two with a good cylinder and revealed not only the compression springs rubbing on cylinder walls but also the absence of a second coil spring in the valve assemblies.



EXAMINES ENCLOSED SURFACES

Even though treated and sealed, these landing gear struts of an amphibian plane can develop internal corrosion and become weakened. Radiography alone can provide an examination of these internal surfaces. So the manufacturer has made it routine in the periodic inspection for service and safety of its amphibians.

Your x-ray dealer will gladly discuss the many ways radiography can aid your business by increasing foundry yield, checking welds and doing many other important and valuable non-destructive inspections.

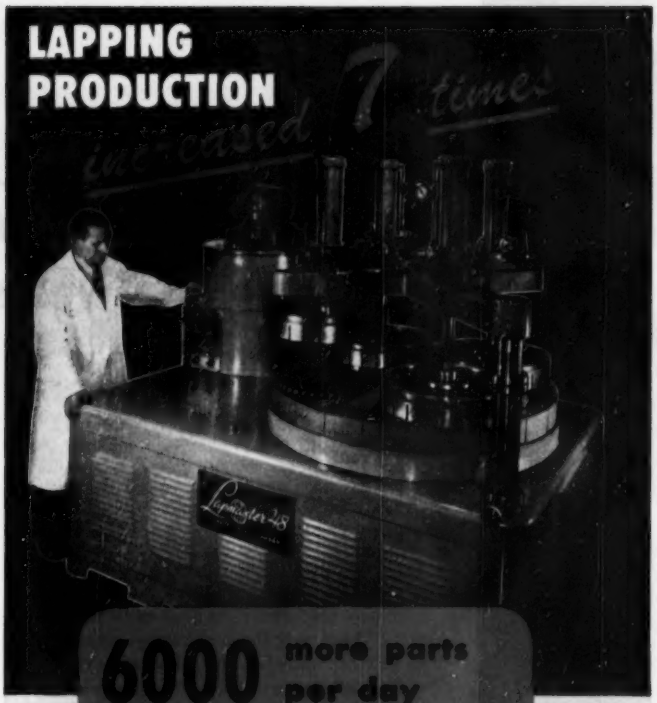
EASTMAN KODAK COMPANY
X-Ray Division, Rochester 4, N. Y.

Radiography . . .

another function of photography

Kodak
TRADE-MARK

LAPPING PRODUCTION increased 7 times!



6000 more parts per day

with bearing surfaces held flat to within 2 light bands ...surface finish to 3 RMS*

*One light band equals .0000116"

With the installation of a Lapmaster "24", this manufacturer of thrust bearing plates increased his production 700%. The lapped bearing surfaces are 5/16" in diameter, and the plates have a .025" diameter stem, 1/8" in length. If even greater production were needed, the Lapmaster "48" shown above could have produced considerably more parts per hour.

Increased production and greater accuracy are benefits common to all Lapmaster installations. Other savings often result.

For instance, Grinding Operations Eliminated!

These thrust bearing plates are turned on a screw machine, hardened and then lapped by the Lapmaster. Grinding operations were eliminated, resulting in a tremendous labor saving.

How To Improve Your Lapping Production And Accuracy

WRITE FOR THIS BOOKLET

This new booklet contains interesting facts on the complete line of Lapmasters. Sizes include 12", 24", 36", 48", and 72". Lapping plate diameter determines machine size and model number. Write, on your letterhead, today. Dept. AM 8, 1836 Cuyler Ave., Chicago 13.

CRANE PACKING COMPANY
LAPMASTER DIVISION CHICAGO 13, ILL.
Offices in All Principal Cities in United States and Canada

ROUND TABLE Discussion

RAT'S NEST

THE SHOP where orderliness is maintained is to be preferred to one to the contrary. Neatness always is conducive to efficiency and morale. We are all acquainted with the fellow who, by the very nature of his make-up, is the embodiment of the sloth—in dress and habits. This does not necessarily mean that the worker should be dressed up like a dude, but he should, for his own spiritual welfare, maintain an atmosphere of tidiness about his person.

This habit carries over to the condition about his bench; you'll find his files in proper order and a peep into his toolbox will reveal orderliness and facility. Different kinds of work necessitates different kinds of dress. One cannot expect a machinist, working on the rough jobs he is called upon to do, to dress as would a toolmaker who comes in contact with nothing of a soiling nature. Some of us, at one time or another, have been assigned to jobs where it was almost necessary to wear a rubber-covered monkeysuit in order to avoid being soaked with oil and grime. This condition prevails, especially when one is working in a job-shop where he is at the beck and call of anything which a machinist is called upon to remedy. I have come out of an engine room in an old Philadelphia firm, looking like one of John L.'s men emerging from the pits.

When one has to work around a grease-spattered engine, with hot steam smothering him as he strives to remedy the trouble, he cannot be expected to look like a freshly plucked daisy. Needless to say that one could do better work in less time if such conditions did not prevail. There are cases wherein the worker goes to the other extreme; he is so fussy about soiling his hands that he spends quite a bit of time wiping them.

Look around and you'll find a shop wherein the workers are tidy looking and the equipment is conformable. You won't see workbenches cluttered with this and that; you'll find things in good order. Then again, take a look into the Junkheap Manufacturing Company—you'll find disorder everywhere. Perchance one of the men will be seen engaged in frantic search, trying to locate something in his tool drawer. A raking stick to be used in swirling things about is not

The all metal table assembly illustrated is spot welded in three minutes on the Sciaky Resistance Welder shown at the right.

. . . Another Example of Cost Reductions Possible with Sciaky Resistance Welders

THE standard, moderately priced Sciaky resistance spot welder used to produce the all steel table pictured has returned its purchase price over and over again. One operator clamps the pieces, makes 72 spot welds and sets down a completed frame in 3 minutes. Contrast this with any other method of assembly!

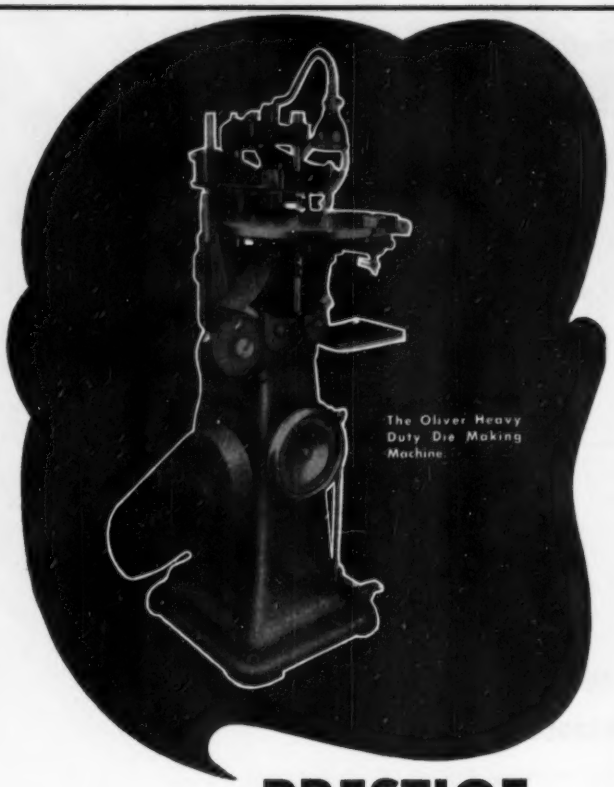
This is not a special, high priced machine. It can be used for a tremendous variety of work—and with special jigs and fixtures the possibilities are almost limitless. For information on Resistance Welders to cut your costs, write today.

SCIAKY BROS., INC.
4919 W. 67th St. CHICAGO 38, ILL.

ABOVE: SCIAKY Model PMCRO Rocker Arm Spot Welders. KVA ratings: 20, 30, 40, 50, 75. Throat depths: 12", 18", 24", 30", 36". Welding Range: Mild Steel (two thicknesses) from .016"-.032" up to .016"-.125". You can't buy a better welder for the price than this exceptionally rugged, precision-built machine. One of a *complete* line of Spot, Seam, Projection and Flash Welders.

SINGLE PHASE OR THREE-PHASE units available. SCIAKY THREE-PHASE design reduces KVA demand 75% or more, provides a balanced load and a power factor near unity. Ask about it!

SEND FOR YOUR FREE COPY OF "RESISTANCE WELDING AT WORK" —containing actual plant studies of welding everything from roller skates to racing cars. Full of useful ideas on HOW TO CUT COSTS. Write today — no obligation.



PRESTIGE

Webster says "prestige" means the power to command respect and admiration. The prestige enjoyed by Oliver comes from actual users of Oliver machines over the years.

The Oliver Die Maker is just one example of how Oliver prestige has been attained. The Oliver Die Maker is saving thousands of man hours daily throughout industry by replacing the old obsolete hand die making method. Savings range from 50% to 60%.

The Oliver Die Maker saws, files and laps; is fast, accurate and simple to operate. This machine will definitely reduce your toolroom costs.

5 MODELS AVAILABLE

No. 1. The Oliver Heavy Duty Die Maker (illustrated above) for sawing and filing tool steel up to 3" thickness.

No. 2. The Oliver SP-2, SP-1 Die Makers for tool steels up to 1" thick. Floor model design.

No. 3. The Oliver S-1, S-4 Die Makers designed for bench use. Capacity for tool steel 1" thick.

Write today for technical information on Oliver Die Makers.

OLIVER INSTRUMENT CO.

1414 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS · TOOL & CUTTER GRINDERS · DRILL POINT THINNERS · TEMPLATE TOOL GRINDERS · FACE MILL GRINDERS · DIEMAKING MACHINES

an exaggeration. He fails to find the necessary clamps and bolts in order to set up a job on the faceplate and in desperation wanders from bench to bench in search. "Where in hell did I see those?" he grumbles.

This recalls to mind a firm up in Quebec which called in the aid of an industrial engineer in order to put the firm on a paying basis. The I.E. took one look at the outfit and made out his report. "Before I can proceed with my research, get a steamshovel in here and clean out the dump."

John Homewood
Ontario, Calif.

•

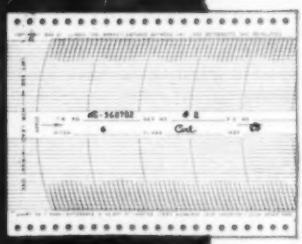
INDEED a rat's nest condition in the shop, whether it be physical or mental, is a reaction upon the men who have to work under these conditions. Just by looking over the equipment, the dress of the employees and the condition of benches, tools, etc., you can usually tell the caliber of work that the plant is capable of turning out. It isn't strict discipline to enforce rules of clean habits. After all, the men spend a great deal of time in these surroundings, and most of them I am acquainted with would a lot rather spend that time in invigorating areas.

The best example I can think of is the foreman himself. Many of these lax habits are his fault. It is his duty to see that the shop is kept in a manner that speaks highly of himself and his men, so let him be the judge of the work to be done. In the shop that I am most familiar with, Saturday afternoons, two hours before quitting time, every fellow in the place turned to and cleaned the place from top to bottom. Every piece of equipment was washed down, running parts oiled, benches squared away and even the floor swabbed and then swept clean with clean sawdust.

Don't judge from the terms that this was part of the U.S.N. It was just one of the best precision shops on the West Coast. We enjoyed the place, and believe me the effect was soon felt by the new men who came to join us. Some of them didn't have the cleanliness habit that we had adopted, and the fellows soon let them know that our shop wasn't just a precision shop by the work that came out of it, it also gave the appearance to any outsider who came through, and many did and their comment was more than enough to compensate for the work.

Loss of valuable time? No sir! We made up those two hours in not having to look all over the place for

REDUCE COSTS WITH ILLINOIS CERTIFIED UNGROUND HOBS!



Every Illinois Certified Unground Hob shipped is accompanied by a Toolgraph* Chart like this . . . proof of accuracy!

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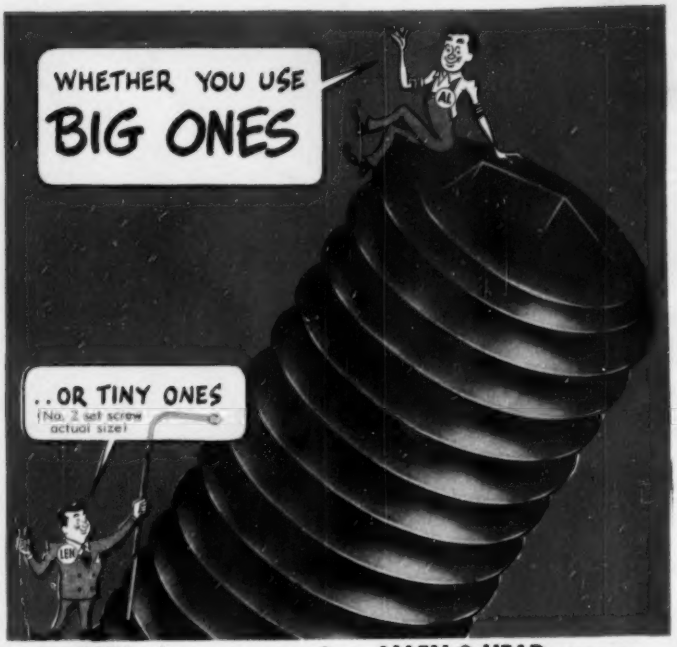
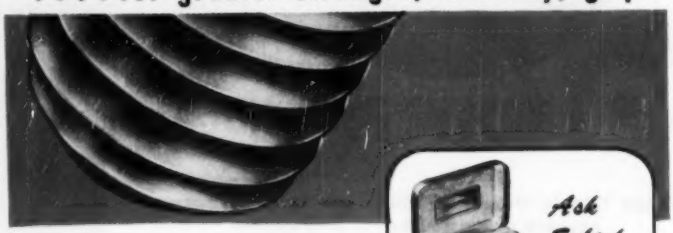


In ANY size get genuine ALLEN ⬡ HEAD screws
. . . . for greater strength, accuracy, grip



Ask Schick

Here's an application for a tiny #6 socket set screw developed by Allen to hold the laminated rotor to the vibrating shaft in a Schick Electric Razor. This Allen ⬡ Head screw, unlike the ordinary slotted type, insures the unfailing performance required by this leading shaver manufacturer.

If you buy for production or replacement . . . Be sure to get genuine Allen ⬡ Head screws in the familiar black and silver striped box. Used with genuine Allen keys and drivers they give you the unbeatable fastening team.

To help improve your product, we work constantly with manufacturers to create better products through more dependable fastenings. We invite you to write us if you have such a problem.

SOLD ONLY THROUGH LEADING DISTRIBUTORS
Write the factory direct for technical information and descriptive literature.

WARNING
Allen-Type screws aren't necessarily Allen-Made.
Get genuine "Pressur-Formed" Allen ⬡ Head screws in this black and silver box.

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NEW YORK, CLEVELAND, DETROIT, CHICAGO, LOS ANGELES

some tool that had a regular place in the shop, and by greatly reducing industrial accidents that take such a high toll in a cluttered area. We even had a few fellows who needed a cud of Brown Mule in their left cheek to oil up the machinery, that soon found a small sawdust filled box to place near their machine to practice their uncanny aim. This was sheer pride and every man in the place felt it. When the man would make his daily rounds, and he did every day, you could see the pride on his face to be at the head of such a going concern. One that looked the part that it was taking.

Also mentioned in the discussion was the subject of pin-ups. Let's not do away with these remaining signs of better days and younger men! How about the old timer whose only thrill is when he passes one of the new calendar poses that has taken its place on the wall or bulletin board. It would be a crime to deprive him of this. I am greatly in favor of leaving the pin-ups to the discretion of the men. Very few of them will display posters that they wouldn't want seen by any one coming into the plant. In the shop that I have just described, we had a dilly of a collection. To gain a spot on the preview board, the picture had to pass a majority vote by the men, and believe me, only the best were allowed to adorn our shop.

Jack Bell
Bakersfield, Calif.

•

Good housekeeping is a definite sign of better quality, improved working conditions and a host of other things. No, you don't have to have good housekeeping in order to have a

"Why don't you just smell my breath?"

ALLOY STEEL SAVES $11,000 YEARLY

It's a cylinder head stud bolt—used by one of America's leading tractor manufacturers—Minneapolis-Moline. At the suggestion of a Republic machining specialist, it was decided to switch from hot rolled steel bars to Republic Cold Drawn Alloy Steel for this part.

Results were *immediate!* Heat treating and straightening operations were eliminated . . . process savings offset higher material cost by .083¢ per piece . . . annual savings amount to $11,000.

This is but one of countless applications in which Republic Alloy Steels—cold finished by Republic's Union Drawn Division—are demonstrating their ability to cut manufacturers' climbing costs.

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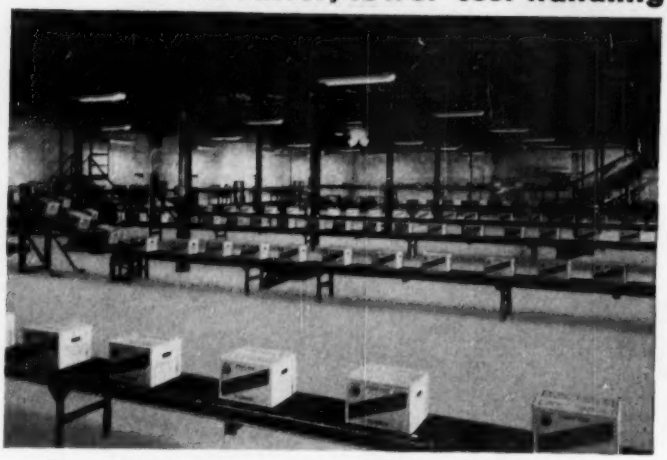
FOUR WAYS

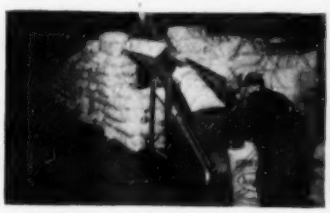
to get results

in faster, lower-cost handling



1 WITH ROLLER AND BELT CONVEYORS

— keep cases, cartons, packages, parts moving — better, faster, cheaper — on Standard gravity or power roller or belt conveyors. We plan and build efficient equipment for any handling need — designed to fit your particular needs — cut your handling cost.



2 with a HANDIPILER

— a portable self-contained conveyor unit. Stacks up to 17 ft. — handles up to 135 lbs. packages — saves time and manpower in storage and shipping rooms.

3 with an INCLINEBELT

— lifts and lowers packages from floor to floor continuously and automatically. Available to meet elevations 8 ft. to 14½ ft. inclusive; handles commodities up to 25½ inches wide.

4 with PNEUMATIC TUBE SYSTEMS

— provide swift, sure, safe transportation of messages, documents, blueprints, samples, small parts, money; cylindrical or oval tubes 1½ inch upward with dispatching and receiving terminals for complete systems to meet your needs. Write for special bulletin SPT.

Write for Standard's general Catalog AM-80. Tell us what you want to handle or name equipment on which you want more information.

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CONVEYORS

quality product, but where the practice is to have a clean shop usually you find better quality than in a dirty shop. Most individuals, whether they be grease monkeys or white collar workers, do better work in clean working areas. It is true that some people never see the mess around about them and usually have to be reminded about the junk that has accumulated.

Sloppy morale? Again it is individualistic. Some people can work day in and day out in a dirty plant. They can step over the board with the protruding nail, walk around the piece of steel balancing on the edge of the shaper just where it was left by some careless worker, and think nothing of it. Why? It is usually because somewhere in their childhood or early working years this education of cleanliness and safety has been neglected.

This does not mean that such workers are any less skilled but does imply that with a better understanding of the ways of industrial life they may live longer and can be of more value to industry. They might even be more valuable than their friends who lack a little in skill but do maintain a clean working area.

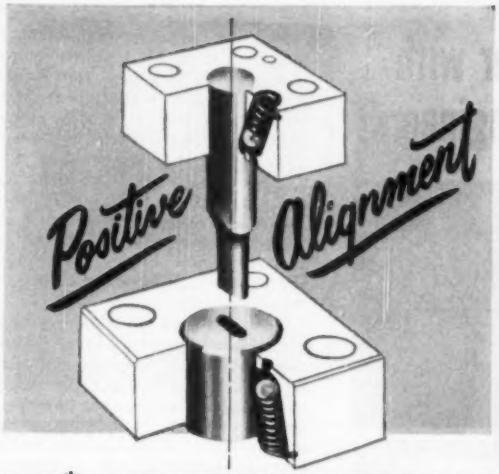
You can't run good housekeeping on army technique. It doesn't work. No one will be driven except in the case of a national emergency. People take exception to having their rights trampled on. So a method of training, education and more education must replace the "do as I say" plan. We must make the worker want to keep the plant cleaned up. We have to show him the reasons it is to his advantage to do so.

Will high production be gained through the use of good housekeeping methods? Yes and no. A high quality of production will be obtained usually when a plant is clean and all workers are mentally alert. Production alone does not mean much unless it is good production. High production can be had but upon inspection of the product for quality the actual production may prove extremely low. So let us say that good housekeeping will improve the quality of the product, improve morale and increase the quantity of good production.

Charles D. Townsend
Ft. Wayne, Ind.

•

THERE was a neat little motto I once saw framed on the wall of a shop superintendent's office. It went as follows: "The day is not so short but that there is always time enough



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...once inserted...a simple matter of a push and a twist...stay in place, accurately positioned both vertically and radially. A ball bearing in the R·B retainer, engaging in the specially designed ball seat in the shank of the punch or outside diameter of the die, keeps the punches and dies perfectly aligned until they are released. That's why you are always assured of trouble-free punching, plus the economies of simple installation and quick changing, when you use R·B interchangeable punches and dies.

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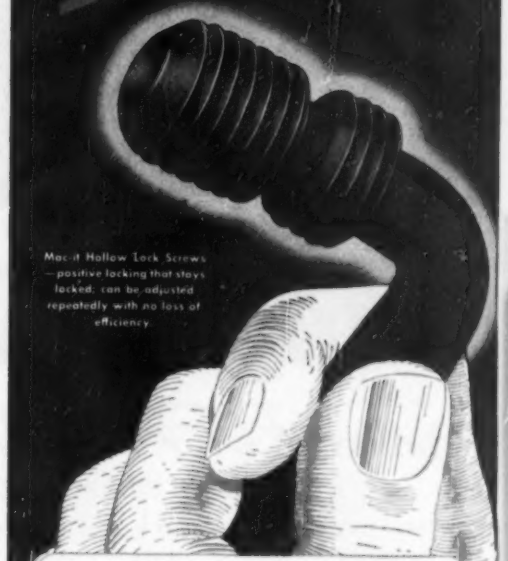

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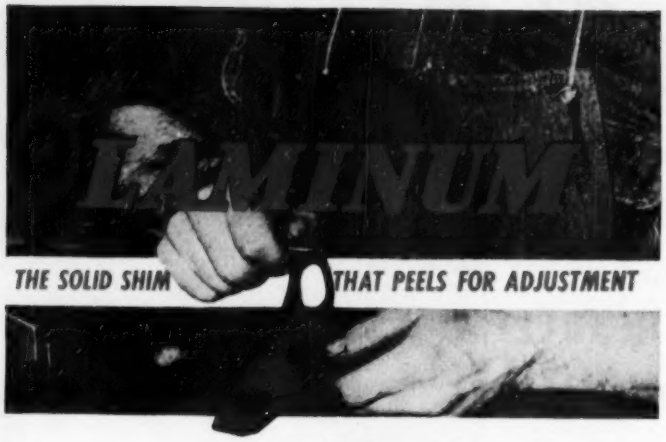

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for cleaning up the work place."

A good foreman knows that there's only a short stretch between sloppy housekeeping in a shop and sloppy morale of the workers in that shop. "Cleanliness may be next to godliness," but a lack of it in the average shop may be next to lower production. When the shop takes on the attributes of a rat's nest with sloppy housekeeping in evidence, it more than often indicates a tendency to sloppy work and sloppier thinking on the part of the workers in the shop.

However, good housekeeping in a shop doesn't "just happen." It is the result of careful planning and conscientious effort. It's also the result of making the workers see how they are involved in maintaining good housekeeping. When the men know that management expects good standards of appearance and deportment from them, the result is better production. When relaxed control by management is being employed rather than strict discipline, it will make the men see that they are being given credit for having the good sense to remedy sloppy housekeeping automatically when it is brought to their personal attention.

When the foreman tactfully and sincerely periodically checks up and inspects the individual worker's phase of the shop's housekeeping, necessary corrective action becomes easy without necessity for strict discipline. Periodic checkups have the value of making the men conscious of maintaining good housekeeping.

A good foreman knows that shop housekeeping, safety, and fire prevention are closely interrelated. A weekly inspection instituted by the

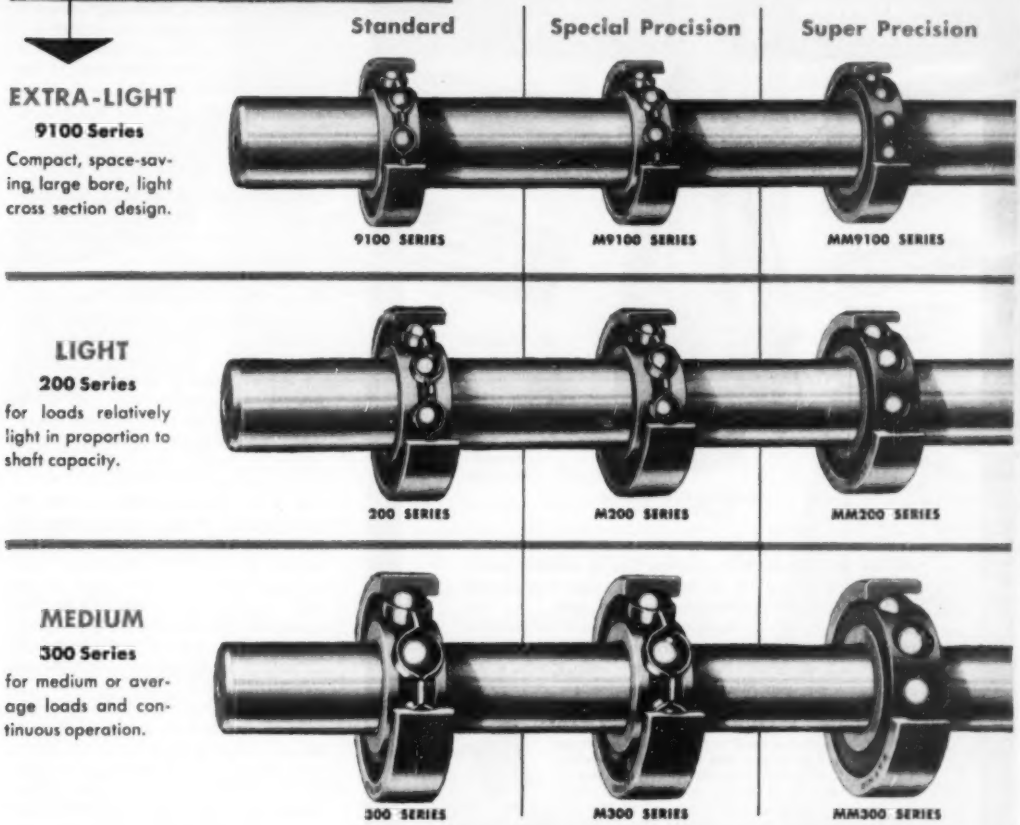
"Compliments of the gentleman on number three turret lathe — and would you mind givin' him a hand?"

Which for YOUR MONEY?

ball bearings that just "get by" or the best ball bearing "buy"

THIS CHART PROVES IT! You can specify the shaft size, speed, load, service conditions, space and weight limitations . . . and get the Fafnir Ball Bearing that meets those specifications exactly. No need to take less ball bearing or more than just what you need . . . because Fafnir makes them all . . . for all industries.

You get something else, too, that makes Fafnir Ball Bearings a particularly good buy. It's an attitude and an aptitude, a way of looking at ball bearings from where you're sitting and an aptitude for doing just what you'd like done about it, gained from working with not just one or two industries but with all industries.



Fafnir Radial Ball Bearings are available in standard shaft sizes in single and double row designs, in duplex arrangements of matched pairs (tandem, back-to-back and face-to-face), and with various arrangements of seals and shields. Fafnir also makes a complete line of ball and roller bearing power transmission units. Write for catalog. The Fafnir Bearing Company, New Britain, Conn.

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1 LESS TOOL COST! W-S complete line of carbide reamers covers over 90% of reaming jobs. Reduced inventory!

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4 IMPROVED DESIGN! New type of tool construction. Highly polished flutes with greater chip capacity.

Rely on the famous W-S complete line of carbide reamers — tried and proved for 15 years — to improve production at LOWER COST! Complete range of sizes . . . wide selection of styles . . . straight or taper shanks of hardened steel. Quick delivery on standard reamers with special diameters and tolerances. Make your next reamer order a W-S order . . . see your Wendt-Sonis distributor.

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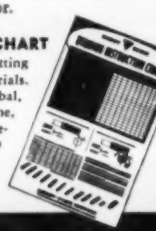

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CARBIDE CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS
DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS
ROLLER TURNING TOOLS • SPECIAL BITS

foreman and conscientiously performed with no ax to grind for or against any particular worker should cover the following items: Are tools and supplies left lying around? Are material and tools in proper location? Is the floor clean and clear of waste? Are the general appearance and general cleanliness of the worker's place up to standard? Are fire hazards and safety hazards covered by adequate protective measures, or are corrective measures necessary?

When this weekly housekeeping inspection is completed, any conditions necessitating correction should be remedied. In this manner a clean, safe shop will be insured. A friendly reminder to the delinquent worker may be all that is necessary in some cases. The foreman's corrective action in this respect will not only aid improvement of the efficiency of the worker but will increase production.

Harry Kaufmann
Philadelphia

•

EFFICIENT supervision is the key to a clean efficient shop. That definitely does not mean strict discipline. Good housekeeping is part of a boss job, but there are a lot of times in some shops where it has to be the policy at times to neglect appearance temporarily or else get less output of work. On the other hand, there are lots of production shops today that can be kept really clean. All scrap pieces and chips are removed every day. The production consists of repetition of large quantities of small parts automatically produced.

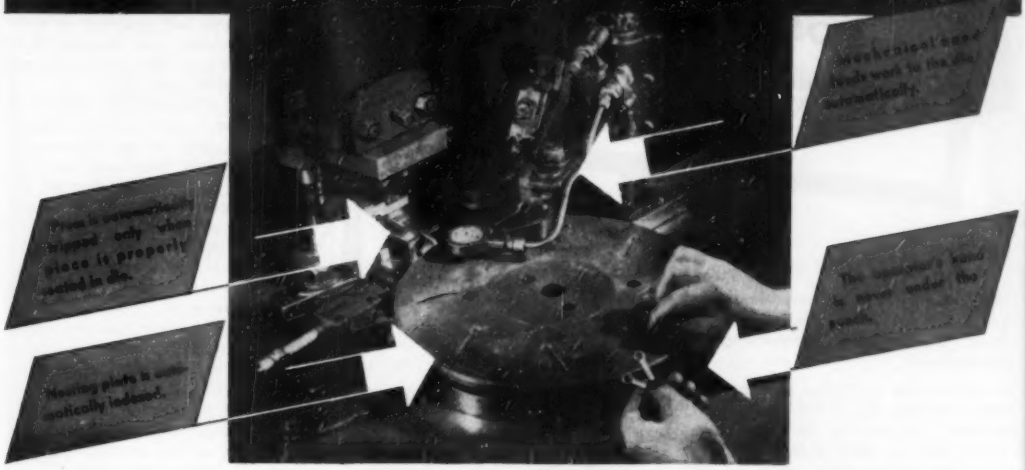
It is a common sight in lots of maintenance shops to see a shapely, good-looking babe's picture, and the fellows being human get quite a kick seeing them. The top brass when they come around being just human stare at these pictures of Eve's loveliness. And why not? These things all help to make less monotonous the job of getting a living.

I don't believe that it is any business of any boss how his employees dress, just as long as they are clean and wholesome in their person and habits. With regard to deportment generally, I thoroughly welcome the change that has taken place through the years. Now often you will see a man whistling and singing and often to the radio, and a group joining in while the work is being turned out faster and better than ever before. Deportment, in my younger days, used to mean that a joke, a song, whistling, in the works, was entirely out of place.

We no longer have strict discipline in machine shops. It has been re-

Here it is!

The V & O FEED-O-MATIC Press Feeder that increases punch press production 50 to 200% *with Safety!*



Users will tell you: When the V & O Feed-O-Matic takes the place of manual feeding for secondary die operations—punch press production increases 50 to 200%!

What's more, the V & O Feed-O-Matic reduces operator fatigue by automatically tripping the press. The operator simply—and with safety—places each piece into the automatically-indexed nesting plate, which conveys the blank to a micro-switch-equipped mechanical hand that transfers it to the die.

The V & O Feed-O-Matic increases die life, too. First, by placing work in the die with undeviating accuracy, wear on dies is minimized; second, by not tripping the press unless the part is in register, costly shut-downs, caused by damage to dies and presses, are averted.

The V & O Feed-O-Matic can be applied to any make of press . . . requires no special dies . . . and can be set-up for new work in an hour or less.

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Write, today, for your copy of the illustrated Feed-O-Matic booklet, which gives you full details, including specifications.

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DIVISION OF ROCKWELL MANUFACTURING CO.

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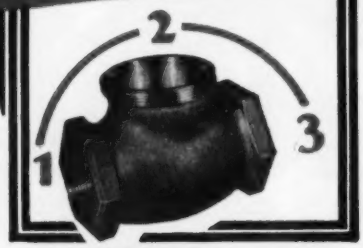
ALL ENDS OF PARTS
Completely Finished
"1·2·3"
ON THE
GOSS *and* DeLEEUW
Automatic Chucking Machine
in 1 SET-UP

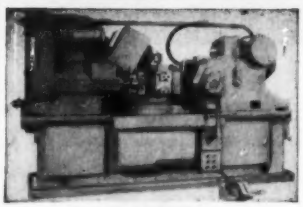


This recent Goss & DeLeeuw development has already received universal acclaim as an outstanding development.

In speed, ease of tooling and precision finishing, the "1-2-3" chucker provides engineering advantages which result in vastly greater production at a fraction of parts' costs by other methods.

Easy, fast change-over from job to job makes this machine ideal for short-run requirements. Sturdy construction, power and speed make its advantages apparent on long runs.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence — a method exclusive with Goss & DeLeeuw and offered on this machine.



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GOSS & DeLEEUW
PRODUCT QUALITY

GOSS *and* DeLEEUW
MACHINE COMPANY, *KENSINGTON, CONN., U.S.A.*

placed by relaxed control. The former failed. In delivering the goods, you know, no person who is subjected to strict discipline is happy and contented. In the Army and Navy, strict discipline is vitally necessary. It is out of place in a machine shop.

Arthur Silvester
Niantic, Conn.

•

LITTLE PLANT SCHOOLHOUSE

THOSE who have a good stock of ambition and a desire to make progress are ever on the lookout to make improvements and progress in their line of business and likewise it is this kind of help that employers are always looking for.

The need of educational work is on the increase in all lines and should be looked upon as an opportunity and encouraged. Our pace has been stepped up to an extent that an opportunity passed up very soon puts one out of the race. However, there are many who require prodding to develop their best talents, yet where resentment is too strong it's not best to crowd too hard.

Changes are taking place constantly in all walks of life, most of them are improvements therefore those who are not in the line of those making good are simply standing still while the crowd walks by and away from them while others in standing still are really losing their place in the line.

Abel Blakeman
Watervliet, N. Y.

•

AN INVESTMENT in knowledge pays the best interest. If a man empties his purse into his head, no man can take it from him. In this case Ed is investing only his time and should be happy to gain this additional education. Along with Ed's other additional duties I can understand Ed's feelings in having to take on this additional home work. However the more a man learns the more he is able to accomplish. If Emerson learned something from every man he met, how about you and I? Ed should know that the things we do today and the methods we use will not be sufficient in the future.

I will always remember these words of the late Prof. William James: Compared to what we ought to be we are only half awake. We are making use of only a small part of our physical and mental resources. Stating the thing broadly, the human individual thus lives far within his limits. He possesses powers of vari-

What a Business Machine Executive learned about DIE CASTING from an Automotive Specialist...

A NOTED business machine executive states there are approximately 1,000 parts in the average adding machine and each of these parts creates its own special production problem. Just recently one of the larger automotive suppliers showed him how, through die cast parts, a considerable saving in the production of these small parts was possible. Today, this saving permits him to place his machine on the market at a more favorable price, an important factor for every manufacturer in the buyer's market.

If you have a die casting requirement in which quality or price is a problem, you are invited to write to

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723 New Center Bldg., Detroit 2, Michigan

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Finest for ACCURACY: Attaches firmly to drill press or tapping device.
Finest for VERSATILITY: Taps anything from soap to nickel steel without pressure on tap—prolongs tap life.
Finest for ADAPTABILITY: Five sizes, standard or built-in models, will fit any drill press or tapping device. 0-1½" cap.
Finest for MAINTENANCE: Requires little or no maintenance.

TORQOMATICS, when used with Jarvis TECNI-TAPS, make the finest possible combination for low-cost, high-quality tapping. Send for free, illustrated, descriptive literature to The Charles L. Jarvis Company, Middletown, Conn.

Jarvis POWER TOOLS

TAPPING ATTACHMENTS
TECNI-TAPS and DIES
ROTARY FILES
FLEXIBLE SHAFTS and MACHINES
QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

ous sorts which he habitually fails to use.

Any man who thinks only of himself is hopelessly uneducated, no matter how learned he may be in other things. I read all the business and trade magazines I can buy or borrow. In each one I read I find something I can use or something new. The post-graduate course is helpful in many ways, especially in aiding us in thinking more clearly in human relationships and in contacts with others. The results are certainly worth the cost. The post-graduate course should be presented in a way that the foremen would not resent. Interest and action springs out of what we desire. The old man should arouse in the foremen an eager want. He should praise the good qualities they already possess and give them a good reputation to live up to. Honest appreciation and a friendly suggestion will usually do the trick.

A. E. Salmons
Philadelphia

•

ED HAS the right idea about training schools for foremen. For over 50 years I've been watching and considering the well-meant attemtps in that direction. My conclusions are that a good foreman is not bettered but is often made less effective, and a poor foreman lacks the fundamental ability to be a good foreman and should be replaced as soon as his limitations are realized. Inappropriate material cannot be substituted successfully for suitable material. Railway rails will never be made from aluminum even by Kaiser. Foremen, like generals, are born and not made. The proper material to start with is required, and that material is an exceptional man. Men of all sorts cannot be melted and poured into what someone thinks is a good foreman mold and, when cooled, be dumped out and used as foremen. The same methods that make one personality an outstanding foreman would insure a dismal failure if adopted by another equally good but different personality.

Given an exceptional man who has native intelligence; a background of apprenticeship; some years as a a journeyman; a good acquaintance with the machine tools, fixtures, work performed, and other employees in the department; an interest in the company's welfare and products; and a pleasant personality; and we have foreman material.

This exceptional man will not have engaged in shop politics, will belong to no clique, and will have shown interest in the work being

done by others as well as by himself, will not be concerned much about how much work he does for what he receives, and will always refer to the company as "We" and never as "They."

The only training school he needs is the School of Experience and he will be learning in that from his first day as a foreman until he steps up into a better job. He will learn most from the mistakes he makes and he will seldom make the same mistake twice. He will decide many things by guess but he will guess rightly many more times than wrongly and his results will be very creditable. He will learn much from every employee under his supervision, and much from the right sort of superintendent or other immediate superior who he should find right at his side with his hand upon his shoulder whenever he is in a tight place. Ultimately his methods will be different from those of every other foreman and they will be a composite of those of many other men and in his sphere he will be the most important man in the organization.

Lucien I. Yeomans
Chicago

NEW BOOKS

HANDBOOK ON DESIGNING FOR QUANTITY PRODUCTION *(2nd Edition). By Herbert Chase. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. 564 pages. Price $7.50*

To keep abreast of recent technological developments, the second edition of this book has been substantially rewritten, and a considerable amount of new material has been added. It is divided into two main parts: the first part deals with the design of die castings, sand castings, permanent mold castings, screw-machine products, stampings, impact extrusions, die-forged parts, hot heading, cold heading, wire forms, powder-metal parts and plastic moldings. Each chapter is complete in itself, and gives full, detailed information on the process involved and the steps to be taken in designing a product to be produced by that particular method.

The second section is in the nature of an analysis, and discusses the merits of one process as against another from the standpoint of cost and productivity. Chapters include:

Steel
Brass
Paper
Monel
Bronze
Plastic
Ceramic
Cast Iron
Aluminum
Stainless Steel
Hamilton, Super-Sensitive, Precision, Small Hole Tapping Machine.
No Matter What Material You Work
If you have small, precision holes to drill or tap; and if this work must be done on fast production schedules; and if you can afford only a minimum of work spoilage and practically no breakage of taps or drills, then, sir, you need a super-sensitive, precision, small hole drilling or tapping machine of Hamilton manufacture. And you can get complete specifications and prices on the Hamilton line of four drills and a tapper from the bulletins which we have had printed especially to convey this information. They are free! Write for them today! You can use the information contained in these bulletins . . .
No Matter What Material You Work
Stainless Steel
Aluminum
Cast Iron
Ceramic
Plastic
Bronze
Monel
Paper
Brass
Steel
Maxi-Jr., Super-Sensitive, Precision, Small Hole Drilling Machine.
THE Hamilton TOOL COMPANY
HAMILTON • OHIO • U • S • A

STOP LOOK

...at this new

Medium Weight DRILLING MACHINE

it's not too light -not too heavy!

Wt. 765 lbs.—25" Swing—
Large Rectangular Table
with Coolant Trough—
Variable Speed Drive
for any size
drill from 1/8" to 1"—
1½ H.P.
Axial Air
Gap Motor—
Tachometer shows exact
spindle speed . . .

Features exclusive on this machine, make the new...

SIBLEY E-25

A REVOLUTIONARY
DRILLING
MACHINE

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Die-cast or Sand-cast? Permanent-mold and Die Castings Compared. Which Type of Non-Ferrous Casting? Die-Cast or Stamped? Die-Cast or Screw-Machine Product? Cold-Headed or Screw-Machine Products? Die Castings and Plastic Moldings Compared. Malleable-Iron Castings vs. Wrought Parts. Sintered Powder Compacts vs. Other High-Production Products.

As a guide to the selection of a manufacturing process best suited to a particular product, keeping in mind the quantities involved, cost of equipment and processing, and type of finish required, this book is highly recommended to engineers and designers.

•

LIST OF INSPECTED ELECTRICAL EQUIPMENT — *Published by Underwriters' Laboratories, Inc., 207 E Ohio St., Chicago 11, Ill. 496 pages.*

Replacing all previous listings on electrical parts and components, the May 1950 issue covers household goods, commercial fittings, and industrial equipment that has been manufactured in accordance with UL specifications for safety. A complete cross-reference index helps in finding approved products.

•

HOLDINGS IN THE A. F. DAVIS WELDING LIBRARY — *By Robert S. Green. Published by Engineer-State Experiment Station, Ohio State University, Columbus, Ohio. 37 pages. 6 x 9. No charge.*

Although this booklet is not intended to be a complete bibliography of the welding field, it lists all the numerous publications in the Davis welding library, and is intended to assist corporations, individuals and other libraries in using the Davis library or in building their own collections.

•

CLASSIFIED DIRECTORY OF WISCONSIN MANUFACTURERS — *Published by Wisconsin Manufacturers' Association, 633 N. Water St., Milwaukee 2, Wis. 800 pages. Price $10.*

Here is an idea that many other in-state manufacturing associations or state chambers of commerce could profitably adopt. More than 4500 Wisconsin firms engaged in all kinds of industry are listed geographically and are indexed both alphabetically and by classification of produce. The

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol Cutting Oil 33-DA

TOOL Files—saw sharpening machine

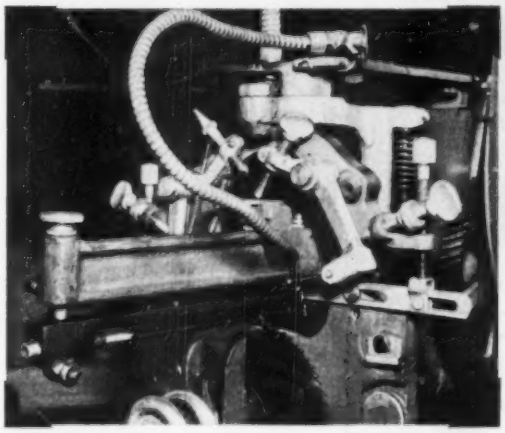
LUBRICATOR Circulating flow onto work

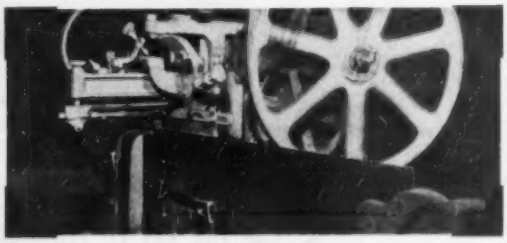
SERVICE All types saws for contractors, printers, etc.

CONDITIONS High temperatures and pressures—metal dust

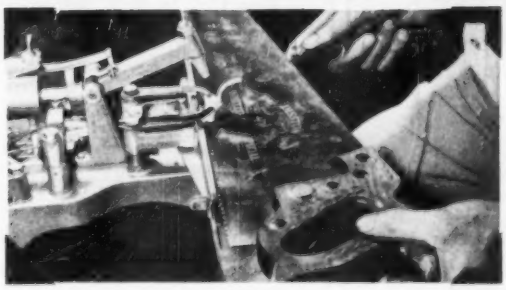
FIRM H. Murray Co., San Francisco

Special oil reduces cutting-tool costs 78%!





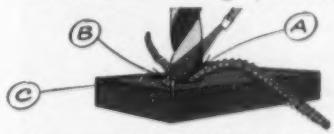
WHEN COMPOUNDED CALOL CUTTING OIL 33-DA replaced a comparable type competitive oil on this filing machine, the work output of each file was increased from 24 saws to 110 and "shut-down time" shortened materially. Circulated by a sump pump onto the tool and work, CALOL Cutting Oil 33-DA preserves the fine cutting edges of the three-cornered files used, keeps them cleaned of metal dust and completely cool. This machine sharpens printers' saws (left), handsaws (above) and band saws.



AN AUTOMATIC SAW-SET MACHINE is used in the shop. Saws are sharpened regularly under contracts with large building contractor concerns and others.

REMARKS: CALOL Cutting Oil 33-DA is only one of many cutting and soluble oils in the complete line made by Standard of California. There are 4 general types for all kinds of metal machining: Mineral oils, ready-mixed compounded oils, concentrates, and soluble oils.

How to up efficiency in all metal-cutting operations



Use the correct CALOL Cutting Fluid for any operation from grinding to broaching. Recommendations for each are made from actual working results.

A. Have high cooling and lubricating qualities—minimize "built-up edge" and promote good finish.

B. Flush away cuttings readily.

C. Protect machine and work against rusting and corrosion.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco
THE CALIFORNIA OIL COMPANY • Perth Amboy, N.J., Chicago, New Orleans
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA COMPANY • Denver, Colorado

It's the CUT that COUNTS

and CAPEWELL'S Exclusive "Statistical Quality Control" Brings You a 10% Sawing Bonus

Capewell's exclusive "Statistical Quality Control" during manufacture eliminates sub-standard hack saw blades—assures you a bonus of 10% extra cutting. Another feature exclusive with Capewell is the printed blade, carrying instructions for proper use.

Ask your distributor, too, for these other Capewell Quality tools: hack saw frames, band saws (in coils or welded), Dafiles, ground flat stock, and hammers.

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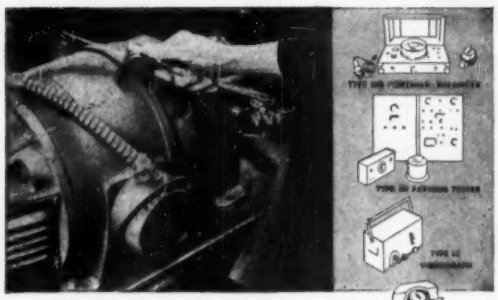
THE KEY TO ECONOMY

THE CAPEWELL MFG. CO., DEPT. 38, HARTFORD 2, CONN.

YOU CAN BE SURE... IF IT'S Westinghouse



Measure Vibration *in a hurry!*

TYPE MH VIBROMETER

Track costly vibrations with inexpensive tools. The Westinghouse Types MH and JC-1 Portable Vibrometers are instruments that supply immediate readings of amplitude and frequency respectively. They provide data essential for elimination of harmful vibration. For complete information on this and other vibration testing equipment, write Westinghouse Electric Corporation, Department E-3, 2519 Wilkens Avenue, Baltimore 3, Maryland. J-02211

Westinghouse
VIBROMETERS

book is a good guide for lining up suppliers, finding sales prospects, locating areas where desired products are readily available, and checking for competition.

•

SPEAKING CAN BE EASY—FOR ENGINEERS.—*Prepared by the Committee on Relations with Industry, American Society for Engineering Education. Available from Engineer's Council for Professional Development, 29 West 39th St., New York 18, N. Y. 24 pages (paper bound). Price $0.50; 25% discount in lots of 100.*

This well-organized manual is designed to help both the speaker and the meeting chairman do their respective jobs more effectively. It can be read in 30 minutes, but is so arranged that its major points can be obtained in only five minutes. Humorous illustrations on each spread emphasize important points. Written especially for the engineer, this manual should be very helpful to the majority who are looking for guidance in public-speaking techniques.

•

INSPECTION ORGANIZATION AND METHODS—*By James E. Thompson, Consulting Management Engineer. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. 369 pages. Price $5.00.*

Written from the management point of view, this book is an excellent guide for those who are responsible for setting up and operating an effective inspection organization. The author discusses the various phases of inspection, explaining how management can gain control of the six fundamentals upon which efficiency depends: objective, operation, organization, man power, methods, and schedules.

The place of inspection in the overall administrative frame-work is outlined and details of the internal organization of the department are given. Included are job duties and sample job descriptions and evaluations. Procedures for all areas of a plant are explained with suggestions for solving inspection problems encountered both in large- and small-lot production.

Several chapters are devoted to inspection equipment, including devices for the non-destructive testing of non-ferrous materials and like equipment.

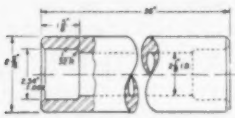
UNITIZE *Multiple Operations!* CUT OFF TO LENGTH AND MACHINE BOTH ENDS — *Simultaneously*

1 Cuts Off to Length

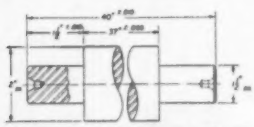
2 Machines Both Ends

Capitalize on Motch & Merryweather's fast accurate circular sawing by combining it with simultaneous double-end machining operations. Save handling and floor space! Increase output and reduce cost! Unitize your production.

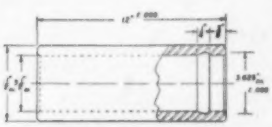
Write for further information.



Operation: Cut off; bore and chamfer inside and outside, both ends.
Material: SAE 1020 steel tubing.
Production: 140 pcs/hr. @ 100% eff.



Operation: Cut off; hollow mill and center drill both ends.
Material: C 1117 cold drawn steel.
Production: 84 pcs/hr. @ 100% eff.



Operation: Cut off; face and chamfer both ends; internal groove one end.
Material: C 1015 seamless steel tubing.
Production: 110 pcs/hr. @ 100% eff.

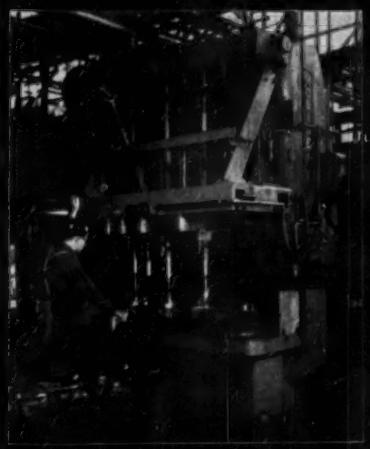
- Chamfers both ends • Center drills both ends • Center drills and chamfers both ends • Threads both ends
- Turns one or both ends (box tool)
- Chamfers O. D. and I. D. of tubing
- Reams one or both ends of tubing
- Chamfers O. D. and reams both ends of tubing • External grooves and chamfers one or both ends
- Internal grooves, faces and chamfers O. D. and I. D. one or both ends of tubing

Manufactured by

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
715 PENTON BUILDING • CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

For Greater PRODUCTION EFFICIENCY SAVINGS



MODEL HU68 universal joint type driller performing core drilling, reaming and facing operation on forged steel parts.

use an individually designed "Hole-Hog" Machine Tool for such jobs as

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- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

Our 50 years of Machine Tool Engineering Experience is at your service. Tell us your particular problem.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

MOLINE TOOL COMPANY
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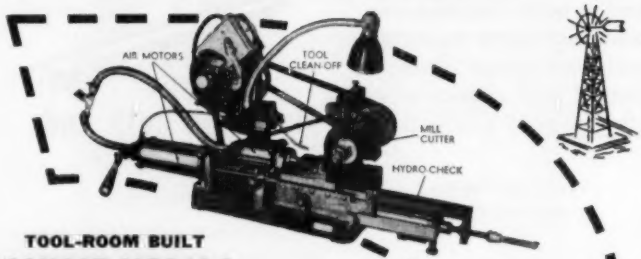

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"WIND"MILL

CUTS COSTS 31% IN MILLING OPERATION

Two Bellows Air Motors and tool-room ingenuity built this special purpose semi-automatic milling machine at a cost less than $300.00. Nicknamed the "windmill" it cut costs on deburring and milling a brass dial shaft 31% . . . dropped operator fatigue to a minimum . . . jumped production to 900 parts per hour.

Bellows Air Motors (the air cylinders with built-in valves and operating controls) spark the imagination of alert production men . . . help them find new ways to do old jobs better and at less cost. No matter what you make, what tools you use, you'll find these ingenious "Controlled-Air-Power" devices can help you manufacture more economically.

Write For Foto Facts File 47-742 and Bulletin CL-15. See how quickly you can spot places in your own plant where "Controlled-Air-Power" can make your production more profitable.

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"Controlled-Air-Power" for FASTER, SAFER, BETTER and lower cost PRODUCTION

The Bellows Co.
AKRON, OHIO

Names in the News

Erwin Rausch has been elected vice president in charge of manufacturing, General Automotive Specialty Co., Inc., New York.

Clyde R. Paton has been named director of engineering, Willys-Overland Motors, Inc., Toledo. In addition to holding various administrative positions at Packard, he also served in executive engineering posts with Studebaker, General Motors, and Ford.

John S. Bugas, L. D. Crusoe, D. S. Harder, Harold T. Youngren, and **Theodore O. Yntema,** all vice presidents of Ford Motor Co., Dearborn, Mich., have been elected directors of the company.

J. Nall Candler has been named administrative assistant to the president and general manager of Morse Chain Co., a division of Borg-Warner Corp., Chicago. He formerly was assistant general manager of B-W's Norge Div.

Irwin W. Peterson has been named salesman in the Detroit area by Grinding Machine Div., Norton Co., Worcester, Mass.

Leonard J. Maguire has been named works manager of Fairbanks, Morse & Co.'s scale plant in St. Johnsbury, Vt. In 1948 he was made chief engineer at St. Johnsbury.

Norman F. Smith

Norman F. Smith has been named plant superintendent, DeVilbiss Co., Toledo. For the past three years he has been chief process engineer with Pyle National Co., Chicago, and served two years following the war as president of Namron, Inc., Chicago.

It's easier with HYATT HY-LOADS

IN ADDITION to the "A-TS" bearing illustrated there are nine other major types of Hyatt Hy-Load Roller Bearings. Four have separable inner races, two have separable outer races and four are non-separable thus giving a designer a wide choice of bearings which permits flexibility in machine design and assembly procedures.

The "A-TS", one of the separable inner race type, is a high capacity cylindrical roller bearing made in two diameter series, wide and narrow widths, to standard AFBMA boundary dimensions.

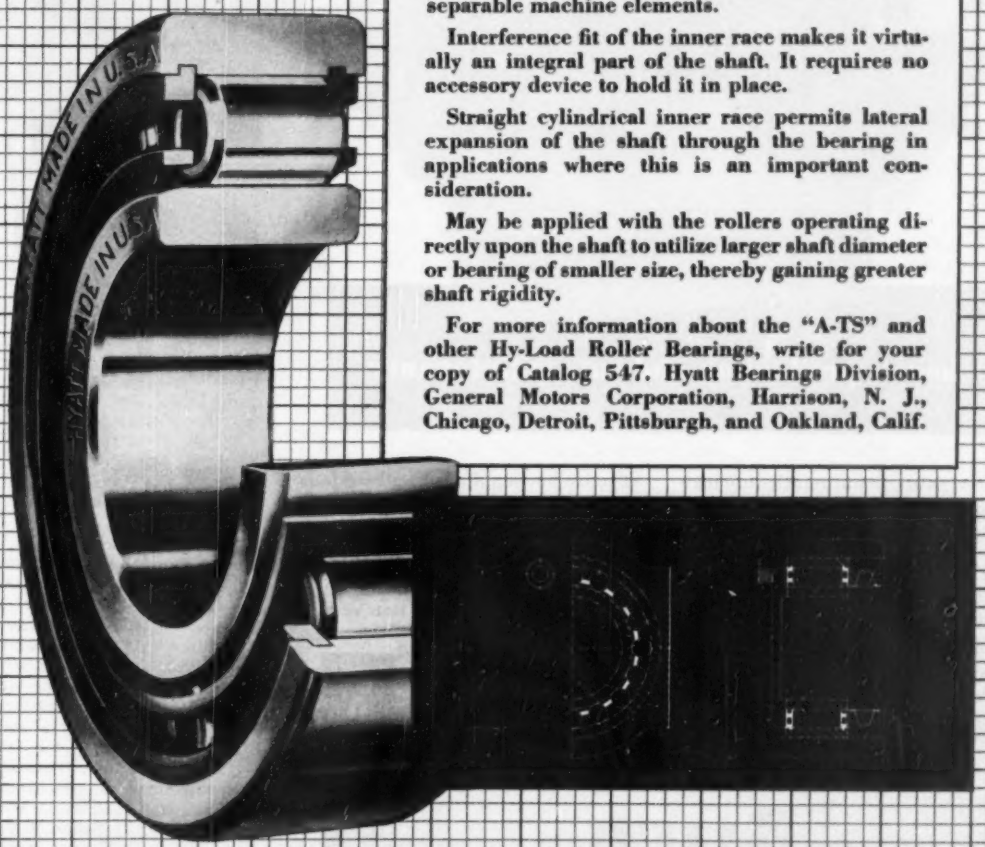
Separable parts are freely interchangeable. Any inner race will fit any roller assembly of the same piece number. This permits non-selective fitting after pre-assembling the two bearing parts in separable machine elements.

Interference fit of the inner race makes it virtually an integral part of the shaft. It requires no accessory device to hold it in place.

Straight cylindrical inner race permits lateral expansion of the shaft through the bearing in applications where this is an important consideration.

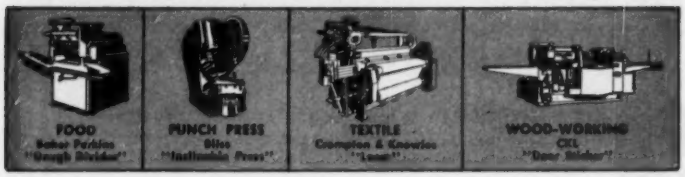
May be applied with the rollers operating directly upon the shaft to utilize larger shaft diameter or bearing of smaller size, thereby gaining greater shaft rigidity.

For more information about the "A-TS" and other Hy-Load Roller Bearings, write for your copy of Catalog 547. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J., Chicago, Detroit, Pittsburgh, and Oakland, Calif.

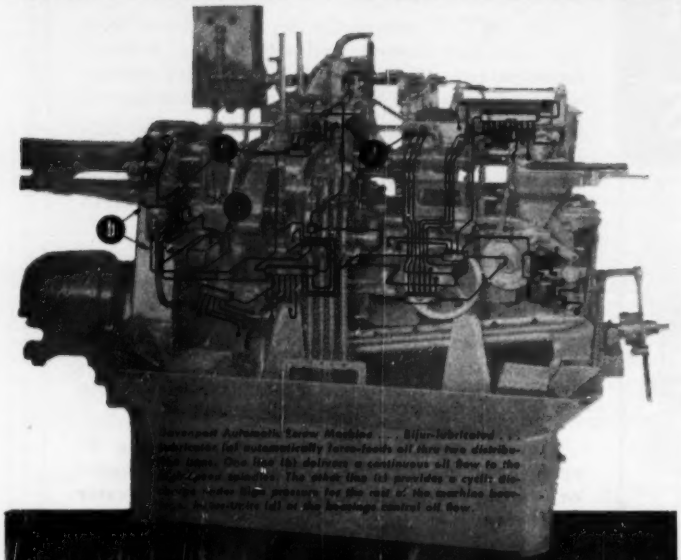


HYATT ROLLER BEARINGS

LEADING MANUFACTURERS BUILD IN THE BIJUR SYSTEM



automatic lubrication



boosts production and cuts maintenance

Designing an automatic lubricating system into a machine doubles your prospects for user satisfaction.

First, maintenance time is converted into more time for production. A Bijur-lubricated machine oils itself during operation, doing away with wasteful down-time for lubrication.

Next, maintenance costs are cut as effective bearing life is lengthened. The Bijur system provides positive Meter-Unit control of oil flow *at the bearings*, considerably reducing bearing wear.

When you design that new machine, call on the Bijur engineer. Meanwhile, for further information write for "The Travels of Modern Lubrication."

389

BIJUR
LUBRICATING CORPORATION

LONG ISLAND CITY 1, NEW YORK

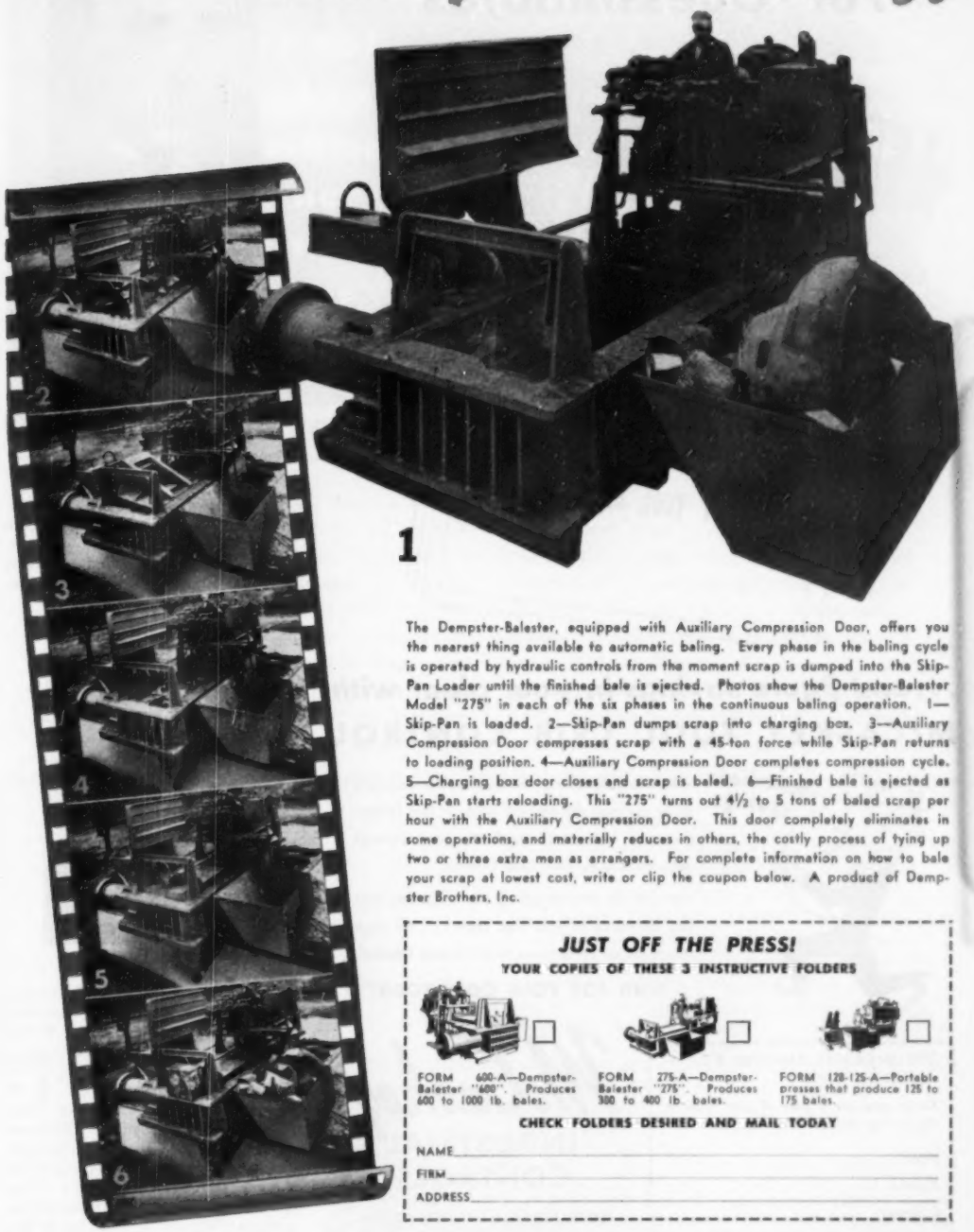
Francis E. Fairman

Arthur W. Bartling

Robert C. Hanna

Francis E. Fairman has been named general sales manager of Large Apparatus Division and **Arthur W. Bartling** has been named general sales manager of Small Apparatus Divisions in the General Electric Co.'s Apparatus Dept., Schenectady. Other Apparatus Dept. appointments: **Robert C. Hanna**, manager of sales, Fractional-Horsepower Motor Divisions, Fort Wayne, Ind.; **William E. Herrmann**, manager of sales, laboratory products section of Special Products Div., succeeding **Robert E. Person**, transferred to staff, mgr. of mfg., Large Apparatus Div.; **Ralph E. Donnelly**, assistant manager, Fitchburg Turbine Sales Div.; **Thorn L. Mayes**, mgr., Lynn Motor Engrg. Div.

here's the nearest thing to Automatic Baling!



The Dempster-Balester, equipped with Auxiliary Compression Door, offers you the nearest thing available to automatic baling. Every phase in the baling cycle is operated by hydraulic controls from the moment scrap is dumped into the Skip-Pan Loader until the finished bale is ejected. Photos show the Dempster-Balester Model "275" in each of the six phases in the continuous baling operation. 1—Skip-Pan is loaded. 2—Skip-Pan dumps scrap into charging box. 3—Auxiliary Compression Door compresses scrap with a 45-ton force while Skip-Pan returns to loading position. 4—Auxiliary Compression Door completes compression cycle. 5—Charging box door closes and scrap is baled. 6—Finished bale is ejected as Skip-Pan starts reloading. This "275" turns out 4½ to 5 tons of baled scrap per hour with the Auxiliary Compression Door. This door completely eliminates in some operations, and materially reduces in others, the costly process of tying up two or three extra men as arrangers. For complete information on how to bale your scrap at lowest cost, write or clip the coupon below. A product of Dempster Brothers, Inc.

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☐

FORM 600-A—Dempster-Balester "600". Produces 600 to 1000 lb. bales.

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FORM 275-A—Dempster-Balester "275". Produces 300 to 400 lb. bales.

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FORM 128-125-A—Portable presses that produce 125 to 175 bales.

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With the guidance of the outline, the example of its use and the factual notes in this folder, you can accurately evaluate your savings with McCaskey Tool Crib Control.

You will be astonished by the reduction that can be made in your tool costs . . . by your return on an investment in McCaskey Control.

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INDUSTRIAL CONTROLS

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William J. Millett

William J. Millett, assistant to the vice president in charge of manufacturing, has been named works manager of Holyoke Works, Worthington Pump & Machinery Corp., Harrison, N. J. He succeeds **E. M. Detwiler,** resigned.

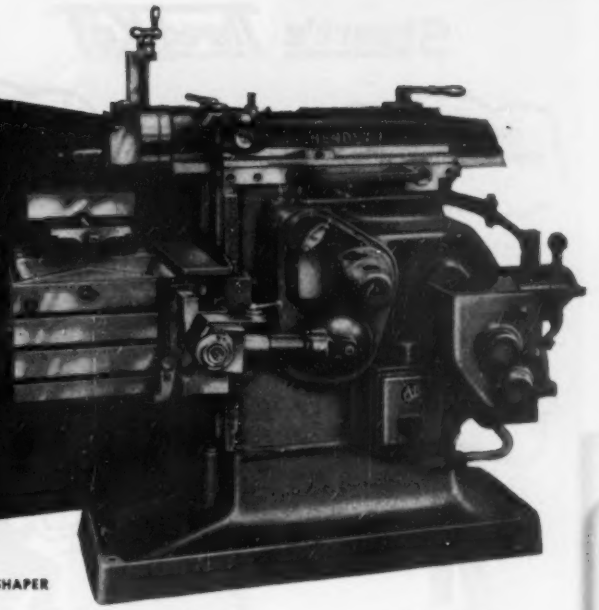
B. N. Brockman, Jr., former advertising and export manager of R. K. LeBlond Machine Tool Co., has been named sales manager of Oliver H. Van Horn Co., Houston, Texas.

A. W. Sawyer has been named assistant to the vice-president, Lincoln Electric Co., Cleveland. He will handle government bids and contracts and also conduct Lincoln's educational activities.

R. B. Crean

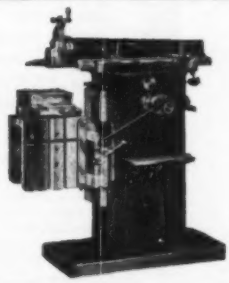
R. B. Crean was recently elected vice president in charge of apparatus sales, Baldwin Locomotive Works, Eddystone, Pa. In inaugurating a sales reorganization policy, Mr. Crean made these appointments: **E. R. Wisner,** manager, Locomotive Dept.; **E. F. Sheehan,** manager, Renewal Parts Dept.; **M. L. Hall,** manager, Testing Equipment Dept., and **R. G. Tabors,** manager, Hydraulic Press & Power Tool Dept. **Andrew Liston,** manager, Hydraulic Turbine & Marine Products, will also have charge of sales of all foundry products.

...If you are not using Modern Hendey Machines you are not earning the profits that you should!



1950
12" UNIVERSAL CRANK SHAPER

A comparison of the old Hendey Friction Shaper with the NEW Hendey 12" Universal Crank Shaper will instantly reveal the profit possibilities that you may be missing. The modern Hendey Shaper offers the most complete, up-to-date shaper available today. Full standard equipment means that there are no "extras" to buy. This equipment *includes* table and vise for positioning and indexing work to any angle—flanged mounted motor—mechanical controls on *both sides*—fully automatic lubrication—quick change swivel head—adjustable, preloaded Timken bearings on the bull gear. The 12" Hendey covers a range which makes it ideal for tool room and production work. Hendey Shapers are also available with capacities from 16" to 28", both standard and heavy duty. Write for full details on the modern Hendey Shapers.



1920

Still using old 15" Hendey friction drive shapers? They have only 2 speeds, 21 and 30½ strokes per min., as against 8 speeds from 14—200 for the new 12" shaper. Surveys prove that the new 12" Universal High Speed Crank Shaper covers a majority of all jobs in most plants. Mechanical changes are almost too numerous to mention—improved accuracy, speed and profits on the new 12" shaper will easily convince you of the advisability of changing *now*!

Continuous, advanced engineering by Hendey is worth watching—and must be watched if you are to earn full profits from your lathes and shapers. For complete particulars and prices, contact your nearest Hendey office.

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D. A. STUART'S THREDKUT straight, or in rich blend, provides fine finish on tough, stringy materials because its high sulphur content gives it excellent anti-weld characteristics.

In long dilutions THREDKUT delivers long tool life and outstanding performance at low cost on free cutting, high speed operations.

THREDKUT'S exceptionally broad range of usefulness makes it cost less than "cheaper" products in the majority of cases and often eliminates the need for several different types of oils. When it comes to *performance* on the jobs within its range, *none can best it!* Write for details and literature.

100% of All Metal Cutting Jobs Can Be Done at Lower Cost with D. A. Stuart's Wise Economy Plan.
Ask about it!

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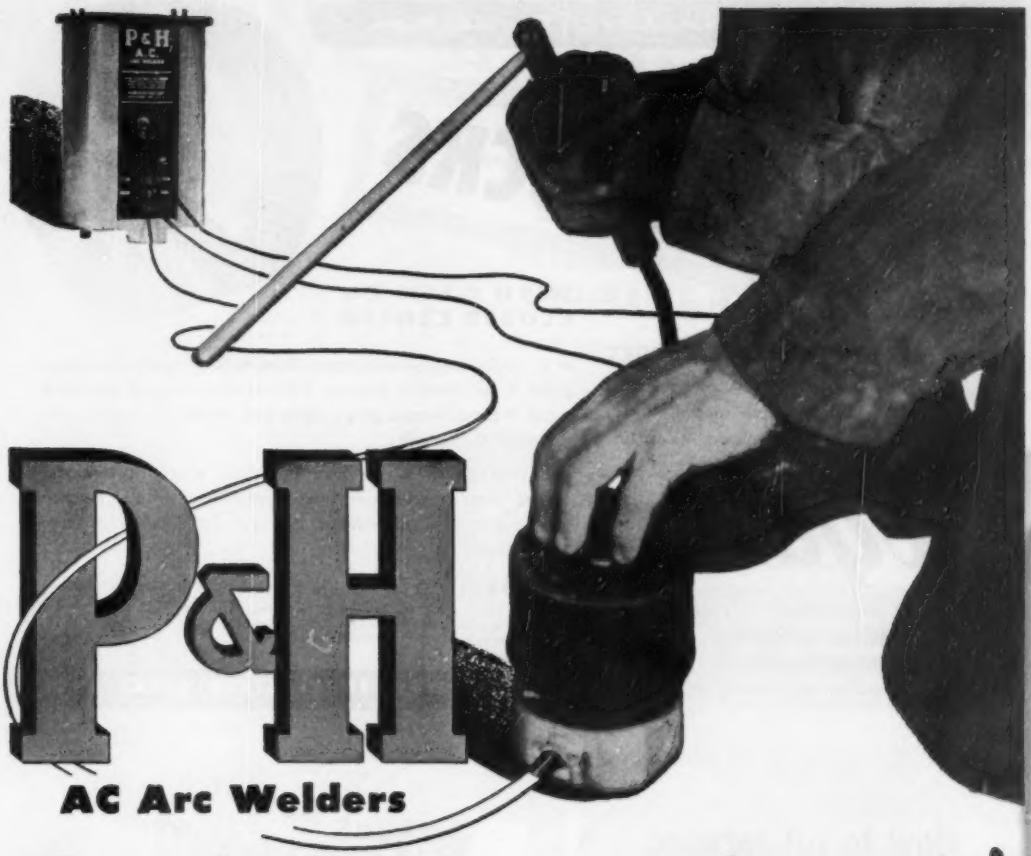

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Additional features are: Easy quick-start arc. Elimination of arc blow. No moving parts to cause delays or maintenance expense. High electrical efficiency that reduces power costs. NEMA rated.

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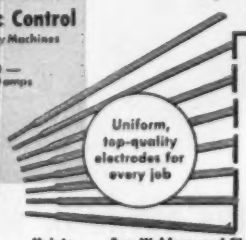

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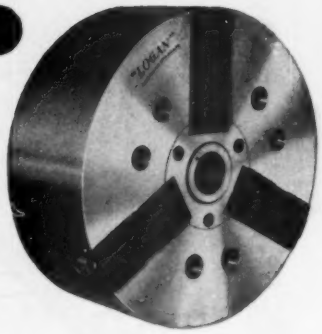

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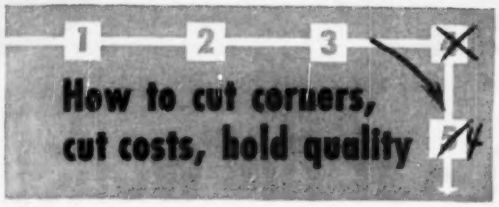
FLUID POWER SPECIALISTS SINCE 1916



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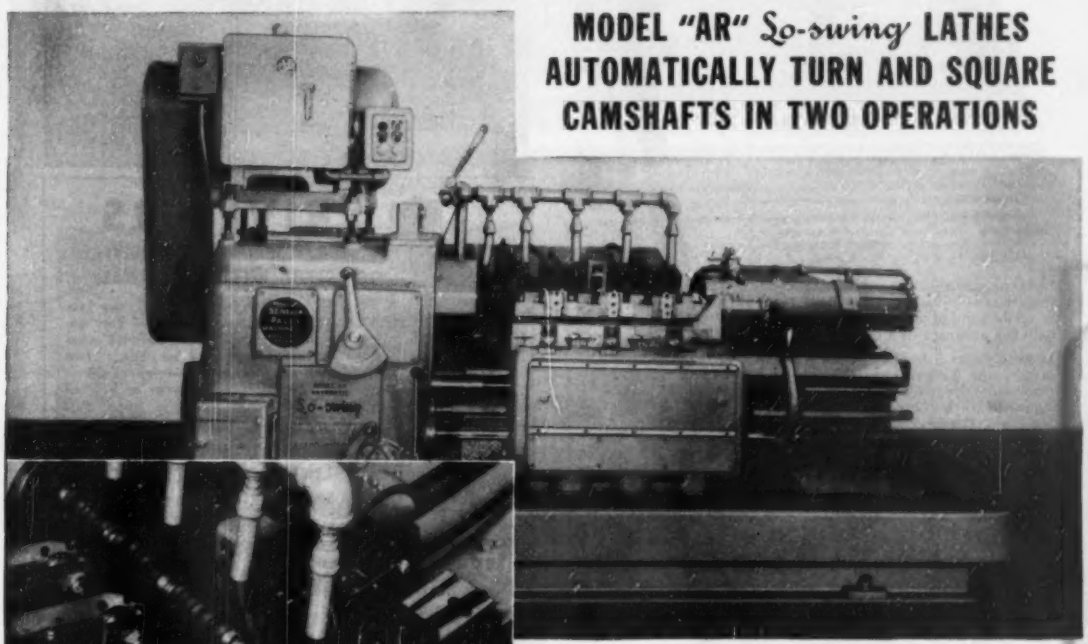
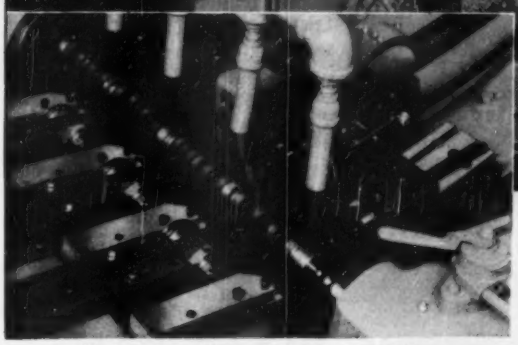
MACHINE OF THE MONTH

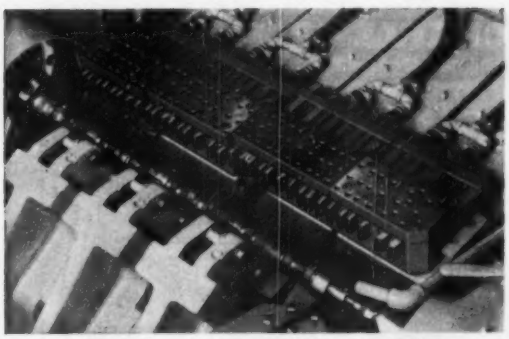
PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

MODEL "AR" *Lo-swing* LATHES AUTOMATICALLY TURN AND SQUARE CAMSHAFTS IN TWO OPERATIONS





Close-up view showing first operation tooling.



Close-up view showing second operation tooling.

Problem: To turn and square automatically forged steel camshafts in two operations.

Solution: Two Model "AR" Lo-swing Automatic Lathes were selected for this job. In the first operation, the camshafts are delivered to the machine centered on both ends and with the pump gear diameter ground to size, thus providing a finished spotting for a two-roll steady rest, which is automatically advanced to support the shaft when the machine cycle is started. Four tools on the front carriage finish turn the line bearings, after which three steady rests automatically move into contact with the work and support it while the rear tools face and chamfer the line bearings. The entire operation is automatic and electrically controlled safety devices automatically withdraw the slides if for any reason the bearings are not turned to size.

In the second operation, the piece is reversed and driven from the opposite end with a 3-jaw, air-operated chuck. Three fixed Steady Rests support the work on the previously-turned line bearings. Two tools on the front carriage turn the unmachined end while thirty-four tools mounted on four Rear Slides square all cam lobes and the one end bearing. Rear Slide movements are staggered so that cutting pressure is limited to the tools of only one slide at a time.

Let Seneca Falls assist on *your* turning problems.

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PRODUCTION COSTS ARE LOWER WITH *Lo-swing*

Protect this VITAL PART of Your Machines!

NUT of alloy steel, heat treated with Class 3 fit thread, and washer face commercially square with threads.
WASHER heat treated steel, chamfered edges. Ground to uniform thickness and hardened.
THREADS Class 3 fit.
SHANK ground for accuracy.
HEAD Machined square with shank. Square, flat surface of head fits machined surface of T-slot.

It is cheaper to use precision made bolts than to repair expensive machines. Poorly made bolts of soft steels can quickly ruin the accuracy of a machine.

Boyar-Schultz S. M. B. Bolts are made to protect the T-Slot. They are precision made from upset alloy steel forgings and threaded for a Class 3 fit. Use S. M. B. Nuts and Washers with S. M. B Bolts for firm, delicate adjustments. They hold work in exact position for heaviest machine cuts.

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COPPER HEAD LAPS . . .

Economy and accuracy are the outstanding features of Copper Head Laps. They work rapidly. Only the replaceable copper sleeves wear out. Sleeve adjustment permits maintaining correct lapping size till worn out when it is replaced with a new one. Save costly tool room time. Available from stock in standard sizes, $\frac{1}{8}$" to $2\frac{1}{2}$" Diameters.

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LINLEY SPINNER TYPE RIVETERS
RIVET WITHOUT NOISE!

Put your production jobs on Linley Spinner Type Riveting Machines. No hammering! — They spin rivet with twin rollers. In most cases the actual riveting time is one second per rivet, so that you can watch costs come down while noise is entirely eliminated! Direct Motor or Vee-Belt Driven. Bench or floor types.

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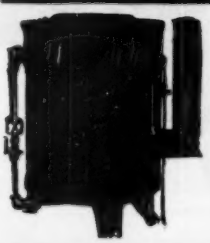

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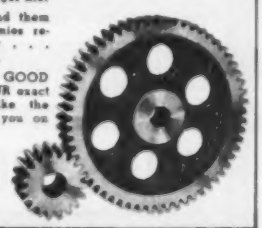

Spur Sprocket Bevel
Internal Helical *Zerol
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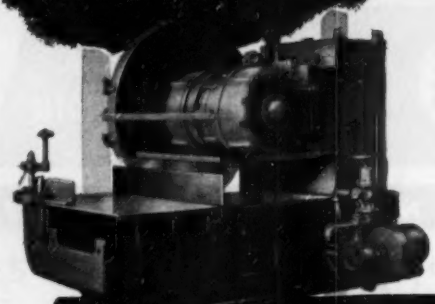
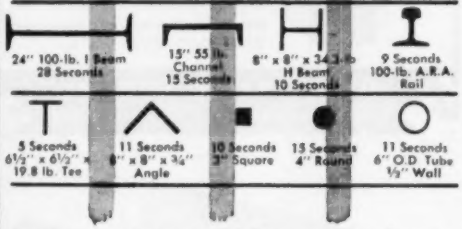
Modern Sawing



with KLING HIGH SPEED FRICTION SAWS



Friction sawing is one of few mechanical processes which employ the heat of friction in a useful manner. It concentrates heat on the material to be severed at a rate which is faster than it can absorb heat. The immediate temperature rise of the contact surface is so great that its strength is reduced considerably lower than that of the colder blade rim. This heated surface is readily removed by the blade and permits complete severing of the material rapidly with no loss of metal from the blade.

Because of its versatile ability to cut many varied structural shapes, as well as solid or hollow bars in any sequence, without change of blade or set-up, one machine can handle a volume of cutting that would otherwise require several separate shears or slow speed saws.

Consult Kling engineers regarding your metal cutting problems. State size of material to be cut. Bulletin No. 9200 giving full particulars and suggestions as to the type and size of saw will be mailed promptly. No obligation.

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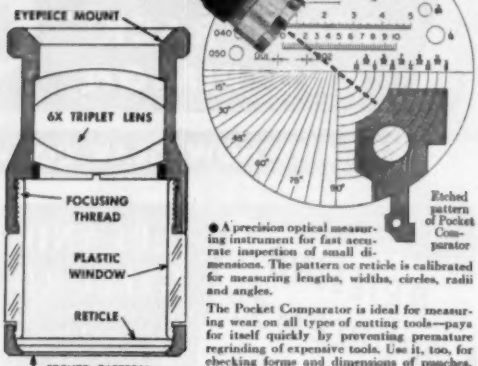

● A precision optical measuring instrument for fast accurate inspection of small dimensions. The pattern or reticle is calibrated for measuring lengths, widths, circles, radii and angles.

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Saves expensive setup time on short or long runs. Ideal for milling, drilling, grinding, planing, slotting, and other operations. Pays for itself over and over. Write for information now!

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For Accurately Sizing and Finishing
HOLES with KEYWAYS, SPLINES, PORTS
Production Men Like These Use
SUNNEN® KEYWAY MANDRELS

Increase Production • Reduce Rejects

• Sunnen Honing with keyway mandrels has solved one of industry's most difficult production problems. These mandrels accurately size and finish bores with slots, openings and other interruptions. Holes are honed straight and round, free from taper and bell-mouth.

Keyway mandrels are available for all diameters from ¼" to 2½".

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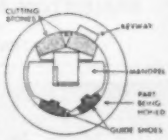

Mandrel, stone and shoe assembly rotates in the bore, with the work floating on the assembly. Rigid guide shoes and extra wide, double-faced cutting stones are spaced to provide stability. Width of stones and guides is sufficient to bridge keyways and splines. This patented design generates a true, round hole.

SUNNEN HONING CUTS PRODUCTION TIME

Eliminates chucking, fixtures and set-up time. Eliminates selective fitting. Removes burrs and flash with amazing speed. Rounds up holes and removes scale after heat treating. You can use versatile Sunnen Honing Machines to save time and money on production jobs, salvage, maintenance and experimental operations.

Stationary equipment hones diameters from .120" to 5.5", portable equipment from .185" to 14½". Hones open and blind holes — any metal, any hardness; as well as ceramics, glass, plastics. For less than $1,500.00 you can have a complete Sunnen Honing installation. Send the coupon now for details.

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"Virtually No Clearance in Our Pumps... Requires Perfect Accuracy and Finish"

Homer C. Lyles
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Vacuum Pump Body
Material — Malleable cast iron
Hole diameter — 1⅝"
Length — 1.0"
Interruptions — ¾" keyway
Tolerance — ± .0001"
Finish — 3 micro-inches
Gage — Air gage
Stock removal — .002"
Production — 25 per hour (including gaging)

"Improved Production and Assembly Operations"

Albert Molnar
Plant Superintendent
Jacquard Knitting Machine Co., Philadelphia, Pa.

Clutch Pawl
Material — 1020 Steel
Hardness — Rockwell 62 "C"
Hole diameter — ⅝"
Length — ¾"
Interruptions — Keyway
Tolerance — ± .0005"
Finish — Extremely smooth
Stock removal — .002"
Production — 100 per hour

"Rounds Up Bore for Free-Sliding Fit"

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Supervisor
Yale & Towne Mfg. Co.
Philadelphia, Pa.

Slow-speed gear
Material — Drop forging
Hardness — Rockwell 50-60 "C"
Hole diameter — 1.291"
Length — 2¼"
Interruptions — Splines
Tolerance — .001"
Finish — Smooth
Stock removal — .0002" to .0015"
Production — 45 per hour

"SUNNEN Honing Is a Fast Method That Assures Accurate Alignment"

H. Warden Plumadore
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Worm Gear
Material — 1118 Steel
Hardness — Rockwell 54-58 "C"
Hole diameter — .625"
Length — 1⅞"
Interruptions — ⅛" keyway
Tolerance — ± .0005"
Gage — Plug
Stock removal — .0001" to .0005"
Production — 100 per hour (including gaging)

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Materials and heat treatment of each of the five load carrying members are balanced for strength and resistance to wear. Principal wear comes on those parts which are most easily replaced, namely, the pins.

Curtis patented the first ball-oiler used in universal joints. Curtis pioneered oil grooves in their center blocks and the Curtis "Tell-Tale" lock ring gives visible proof of complete and correct assembly.

Buy direct from Curtis — sole makers of Curtis Universal Joints. Standard joints in 14 sizes are IN STOCK FOR IMMEDIATE DELIVERY.

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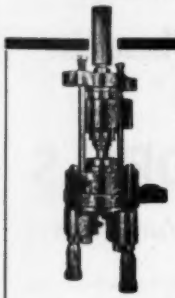
Only ERRINGTON *Adjustable* TAPPING HEAD Offers So Many Advantages



Sizes: #0 - #16 Tap to 5/16"
#1 - 3/16" Tap to 1/2"

No. Spindles: 2 to 6

Here's a versatile tool which permits you to take advantage of a wide range of adjustment — without overhang. Supplied with 3 spindles for equal adjustment in line and 3, 4, 5 or 6 spindles for equal adjustment on bolt circles.

- Fully geared
- Needle bearings on all spindles in head
- Ball thrust bearings throughout
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Established 1891

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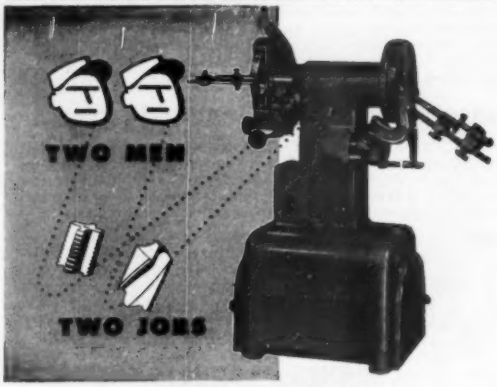

ONE MACHINE

● Working simultaneously, these men save time, floor space and maintenance costs in your tool room. Providing them with the facilities of two single-purpose machines, the Grand Rapids Tap and Drill Grinder accurately sharpens worn taps and drills to the correct cutting and clearance angles required for precision work. The rigid spindle is ruggedly built to resist heavy combined radial and thrust loads, and large wheel guards and flanges insure maximum safety. Grinding surfaces are dressed by a new, diamond truing device. The long life of this machine is assured by Grand Rapids' widely recognized reputation for sturdy, heavy-duty construction.

To serve you — Your inquiry concerning your specific grinding needs will receive prompt attention. Grand Rapids Grinders include: Hydraulic Feed Surface Grinders, Universal Cutter Grinders, Hand Feed Surface Grinders, and Combination Tap and Drill Grinders.

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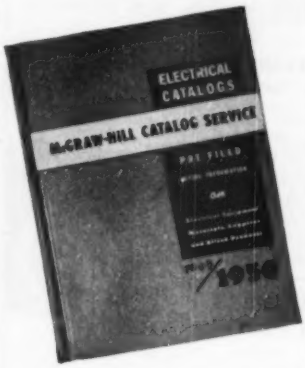

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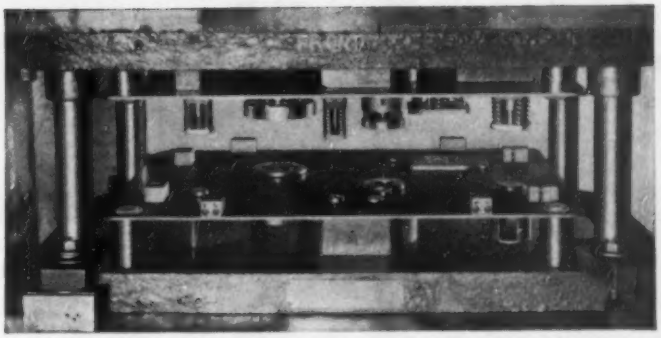

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NEW and FAST Method for perforating Sheet Metal

SAVE PRESS DOWN TIME. Approximately 15 minutes required to change from punching one subject of say 20 holes to a different 20 hole arrangement. Whistler Magnetic Perforating Dies *increase* press production.

HOLD CLOSE TOLERANCES. Hole centers may be held to .0005" accuracy or as close as can be jig bored.

GREATER PUNCH AND DIE LIFE. Concentricity of punch and die assured thus giving uniform clearance around punch, increasing punch and die life.

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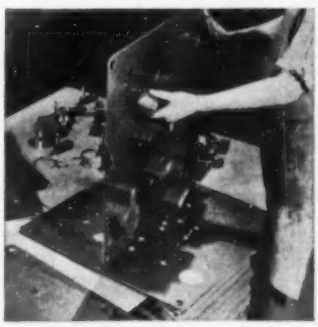

● Die retainers complete with bushings being inserted in die templet.

REDUCE DIE COSTS. Whistler Magnetic Perforating Punch and Die units are used repeatedly for different hole arrangements. When completing one job, remove all units from templet and put them into service on the next different set-up. Combine any number of hole sizes and shapes. Punch and die costs are amortized over continued reuse in many jobs.

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Whistler Magnetic Perforating Punches and Dies have *proven* their cost-cutting advantages in many prominent plants. The catalog shows how. Send for it today.

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Also manufacturers of a complete line of drawing, forming, blanking and progressive dies to special requirements.

Cars keep rolling off line when parts "fly" to the job

Increased production at a West Coast assembly line caused a parts shortage. Shipment in transit was located at St. Louis in late afternoon and Air Expressed to coast. Delivered 5 A.M. next morning. Speed like this keeps production rolling, lets you meet every delivery date. The cost? Shipping charge for 50-lb. carton: $24.56.

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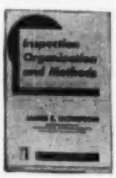

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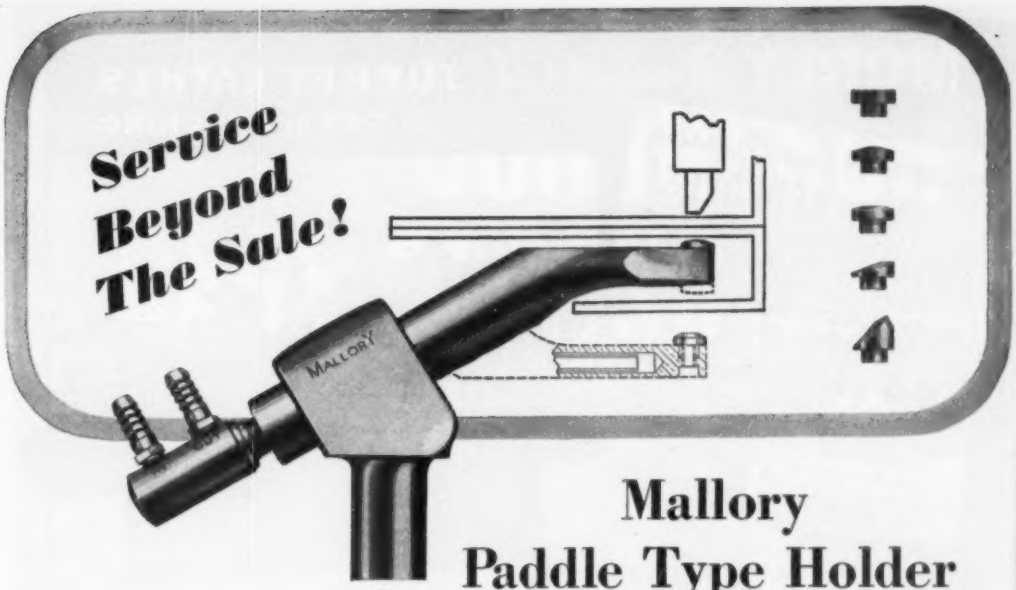

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Mallory research and development facilities are unique in the resistance welding field . . . have given you, time after time, new, time-saving, production-building designs for tips, holders and dies.

One such new development is the Mallory Paddle Type Holder . . . water cooled . . . easily adjustable in amount of offset, angle of rotation, and with replaceable tips that can be used on either face of the holder. It is specially designed for heavy duty, high pressure service on those "hard-to-reach" spots. Utilizing a wide range of standard button-type tips, this holder speeds up operations in a great variety of inaccessible places.

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Positive leak-proof construction.

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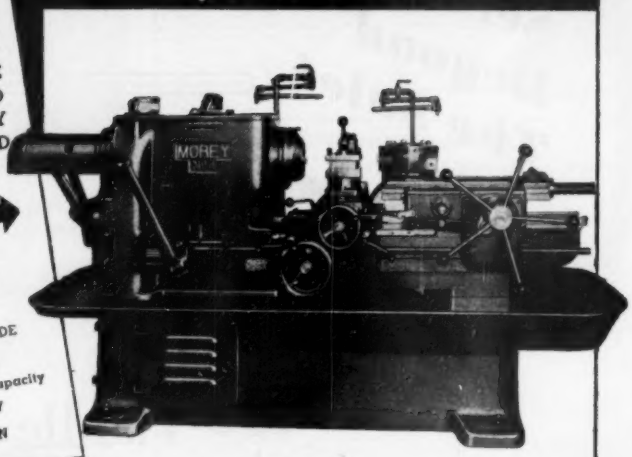

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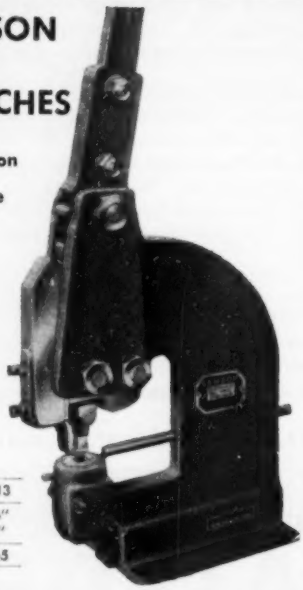

SIZE	No. 8	No. 13
Punches through steel	5/16" 1/4"	7/16" 3/8"
PRICE	$37.40	$75.65

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WITH **STONE "SWING-CUT"**
CUTS WET OR DRY

Typical Cutting Times
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Metals in any size or shape up to 3" solids and 4" pipe cut with milled-like finish to tolerances of .008. Fast-acting, self-centering vise for angle cutting to 46°, air activated either hand or foot controlled. Vee-Block jaws for cutting rounds and tubing can be supplied.

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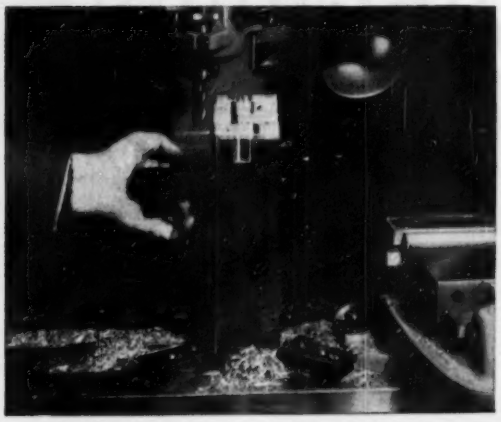
NEW JAW CLAMP

Gives Faster Set-up, Stronger Grip, Less Obstruction of Work-Piece



Tool Show photo shows set of J & S "All-Purpose" JAW CLAMPS holding tall, narrow work-piece for milling operation. Note 45° direction of jaw travel in hand-held clamp.

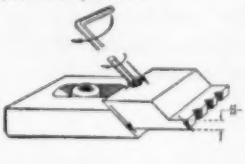
J & S "All-Purpose" JAW CLAMPS

quickly secure almost every size and shape work-piece to face plate or table.

One Adjusting Screw controls all pressure needed, facilitates controlled centering. No secondary operations, separate parts. U-Clamps and straps, different length studs and blocking are eliminated.

Powerful Inward, Downward Grip holds work-piece rigid while forcing it against machine.

Jaws Only 23/64" Thick allow overall machining of work to within ¾" of machine surface. Overall clamp thickness in working position only 15/16".



Direction of travel of jaw is 45° with plane and machine face. When screw is tightened, jaw simultaneously secures work-piece horizontally toward opposite jaw clamp, downward against face plate or table.

General Dimensions: 3¾" long, 1½" wide, ¾" deep. For planers, etc.: 7½" long, 1½" wide, 1¼" high. "T" nuts furnished to fit all standard machines. Slots of larger clamps are 4" long—allow 3½" adjustments. **WRITE FOR FURTHER INFORMATION**

SEND FOR BOOKLET "Machine Shop TIME SAVERS by J & S". Illustrates and explains: J & S "Fluidmotion" Dressers, KOALA Circular Cutting Tools, "Down-Hold" Vise Jaws and "Attachable" Parallels, "All-Purpose" Jaw Clamps, and J & S Form Grinding Service.

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You should know MORE about FULMER HONING MACHINES

Fulmer Model 412
½"-4" honing capacity

. . . to get high speed accuracy on finishing all types of cylindrical bores from ½" to 30" diam. Fulmer Honing Machines remove stock **faster, more economically,** with **greater** accuracy, **than any other method.** Rugged in construction, simple to operate, Fulmer Honing Machines give maximum production with minimum investment.

★ **WRITE FOR NEW HONING BULLETIN, fully illustrated.** Gives valuable information on honing applications, **Alexander Ball** tools, and specification details on all models of Fulmer Honing Machines.

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The Alexander Ball line of honing tools is now distributed exclusively in the United States by C. Allen Fulmer Co. Available in sizes from ½" to 50" diam. In many sizes of these tools, removable flanges are available in 1" or 3" increments of diameter. The same stone holders and basic tool are used. With **Alexander Ball** Tools the investment is very low where a wide range of diameters are honed. Write for complete details and prices.

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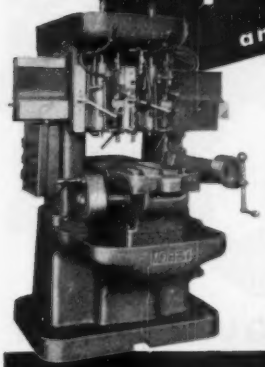
MOREY 12M HIGH-SPEED VERTICAL PROFILER and MILLER



Two spindle or single spindle

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You can get *immediate* delivery from a standing stock of over 28,000 standard Staples carbide-tipped circular and single point tools.

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Special Machinery

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LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips MEANS MAXIMUM CUTTING EFFICIENCY

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. . . for precision work

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The cylindrical plungers in the Waltham Sub-presses slide in babbitted bearings. This bearing is tapered on the outside and can be forced downwards, thus reducing the inside diameter to fit the plunger when the latter becomes worn through use. Exact alignment and constant precision can be maintained throughout the life of the die. Write for information about the nine sizes.

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WALTHAM MACHINE WORKS
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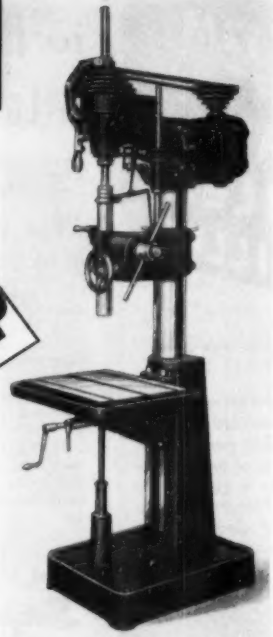
"Buffalo" NO. 22 DRILL

You'll like its LOW UPKEEP

— Its Easy Handling

— Its Rugged Construction



● The No. 22 Drill is the result of engineering to give you the "most drill". All controls are easily reached. Eight speeds, 65 to 1350 r.p.m., for 3/16" to 2" holes. All setup adjustments easily made, without wrenches. It's 94" high, with 5.5" column, 1.312" spindle. There's 27½" of space under spindle nose, enough for 95% of the work. You're buying "all drill without the frills" when you buy this big, accurate machine! WRITE FOR BULLETIN 2989-E.

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GIVE TO CONQUER CANCER

AMERICAN CANCER SOCIETY

From the *American Machinist* Library of *Tips for Top Shop Men*

BE careful neither to underestimate nor to overestimate the men you pick for promotion. A man may make an excellent *production* executive dealing with details and concrete things, but be out of his depth when he faces the intangibles of *administration*. He may be a whiz at watching the trees and no good at watching the forest.

AN essential to efficiency is regularity. The brilliant, but erratic—or the fast, but frequently absent—man will rarely show any efficiency. Remember the hare and the tortoise.

"WELL---
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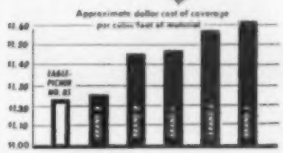
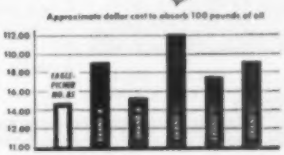
Here's proof that Eagle-Picher Floor Dry No. 85 is tops in efficiency, economy

Comparative Coverage Costs



Comparative Absorption Costs



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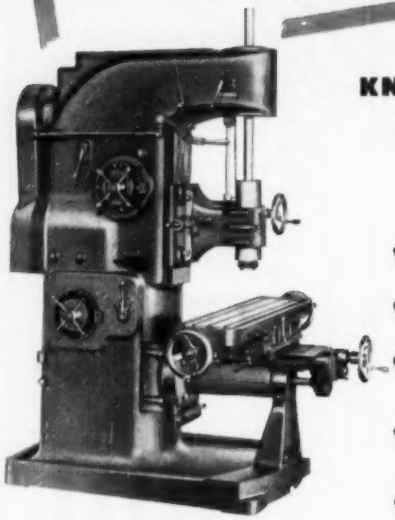

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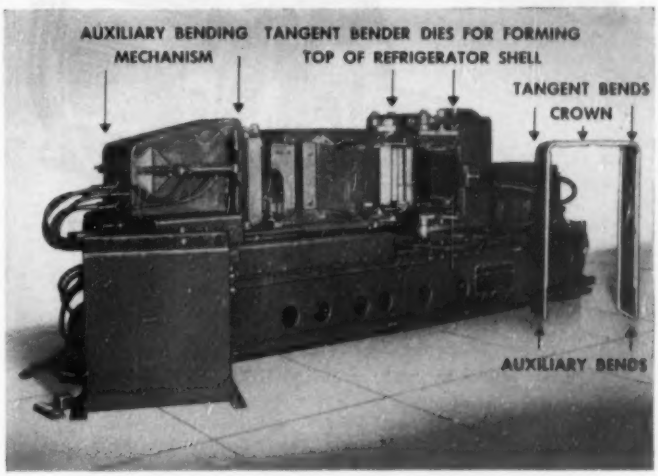
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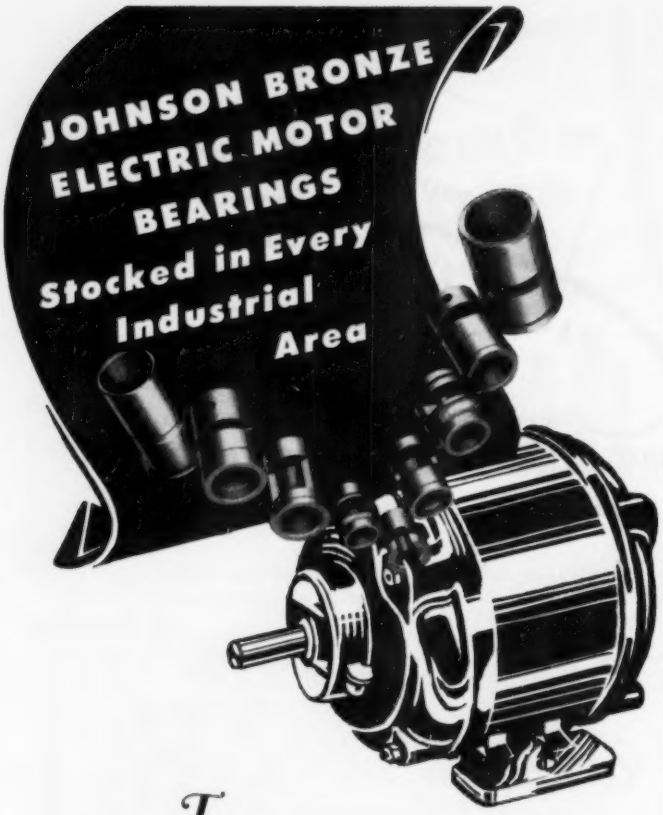

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The 1947 U.S. Government Census reports 44,923 metalworking plants in the following categories:

Manufacturers of Fabricated Metal Products	16,734
Machinery (except electrical)	17,906
Electrical Machinery	3,973
Transportation Equipment	3,711
Instruments and Related Products	2,599

In 1947, these plants employed 4,731,820 people . . . industry's largest labor force. Of these people, 4,321,684 worked for the 10,151 plants that employ 50 or more workers each.

Metalworking is big . . . active . . . growing. And *American Machinist* is the metalworking magazine more metalworking men read than any other. They read this magazine because its editorial and advertising pages are their most useful and diverse source of information on the production methods and equipment through which Metalworking can keep on growing . . . and doing a better job of serving its customers.

American Machinist

The McGraw-Hill Magazine of Metalworking Production

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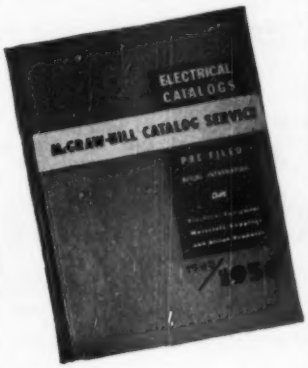

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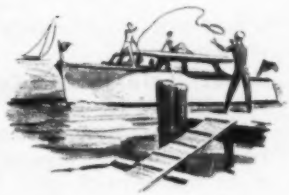
How Production-Wise Manufacturers Save Time and Money with AP JEWEL ABRASIVES

ON LAND

The gleaming stainless steel that makes up these modern truck trailer bodies is polished with BONDITE* Jewelox paper belts. Because they cut faster, last longer, Jewel Abrasive Belts can roll up sanding savings for you, too!



ON THE SEA

Torn covers on drum sanders were causing costly slow-downs in finishing plywood sheets for this boat builder. AP Sales Engineer recommended change to super-tough Jewel Bondex Garnet Fibre. Builder reports, "These Jewel drum covers are the best we've ever used!"

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The stainless steel "skin" of a modern airliner needs careful sanding before final buffing operation. This steel manufacturer supplying the aircraft industry found that AP's special BONDITE* Jewelite paper belts cut faster, lasted longer than previously used abrasives.

*Moisture repellent and heat resistant.

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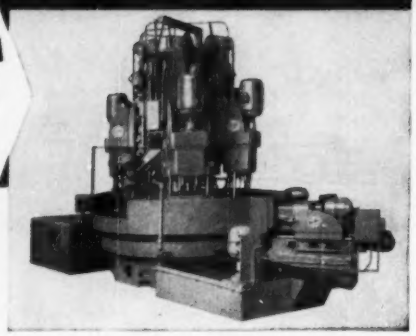
...USE DAVIS & THOMPSON *Roto-Matics*



Here's a good example of the application of standard machine units to a special production job. Drilling and reaming operations of suspension support holes are performed on both right-hand and left-hand parts simultaneously. Drilling and reaming king pin holes is also included. Six stations, five operating and one loading, handle all operations with a total of 16 spindles. Machines of this type can be furnished from standard basic units for special applications on most all metalworking operations.

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Machines similar to this can be designed to handle dissimilar operations in the same parts or one operation on continuous production. An indexing table with ROTO-MATIC POWER HEADS is easily arranged to suit special machining operations.

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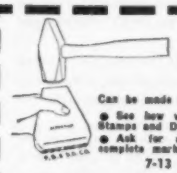

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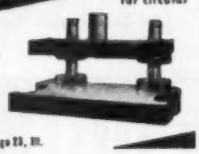

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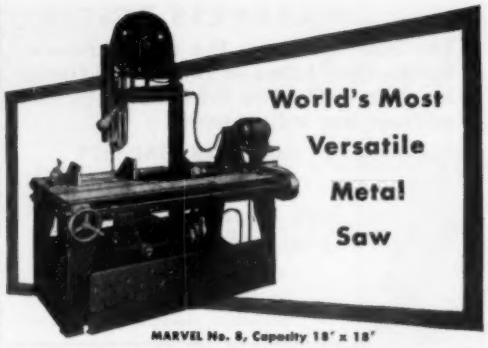

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SELLERS 9" Bar Table Type, latest type

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BULLARD 24", 36", 42" "Spiral Drive", Latest Type
NILES 180", 2 turret heads, Rapid Traverse, AC M.D.

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NATCO #4AL Multiple, 30 spindles, Hyd, Latest Type

GEAR CUTTING EQUIPMENT
BILGRAM 6" and 16" cap., Bevel Gear Gen., M.D.
FELLOWS Model 61, 61A, 62, 7A, 72, 75B, 77
High Speed Gear, Shaper, Latest Type
FELLOWS #13LS Lapper, latest type
GLEASON #16 Hypoid Spiral Grinder, Latest Type
GLEASON 3", 12" straight bevel generator, latest type
GLEASON 24", 27", 77, 96" St. and Bevel Gear Planer.
GOULD & EBERHARDT 18H Hobber, Motor Drive
GOULD & EBERHARDT 96H Hobber, with diff. M.D.
NEWARK #5, 72" Hobber with infeed and Diff. M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest

GRINDERS—Cyl.—Plain & Univ.
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CINCINNATI 16"x36" Model E.R., Univ., Latest Type
LANDIS 4x12, Type H, Plain Hyd., Latest Type
LANDIS 6"x18" Type C Plain, Hyd., Latest Type
LANDIS 28"x120" Plain Roll, Motor Drive
NORTON 6"x18", 6"x30", 10"x72" Type C, Plain, Latest

GRINDERS—Miscellaneous
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HEALD 72A3, 72A5 "Gagematic" Internal, Latest
HEALD 72A3, 72A5, Internal, latest type
La POINTE 60" Universal Broach Sharpener, Latest
THOMPSON 6"x48" Auto. round broach M.D.
VAN NORMAN #639, #73 Osc. Radius Grinder, Latest
VAN NORMAN #666 Crankshaft ReGrinder, Latest

GRINDERS—Surface
BLANCHARD #11, 16" dia. mag. chuck, Latest
BLANCHARD 16A Vertical, Dial Feed, Motor Drive
HANCHETT Series 300 12"x48" Vert. Hyd., Latest
HANCHETT #12s 30x120" Plano, Hyd., Horiz. Latest
HEALD 25A—rotary—10", 24" 20" chuck, Hyd., Latest

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MICHIGAN 1712 Universal, Latest Type
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BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
GISHOLT #3, Univ., Timken, Latest Type
LIBBY "International" 1H5 Univ., Timken, Latest
MOREY No. 20, No. 3, No. 4 Timken Bearing, latest
POTTER & JOHNSTON #5DE, Timken, Latest
WARNER & SWASEY 5, Universal, Timken Bearing
WARNER & SWASEY 2A Univ., Timken, Latest
WARNER & SWASEY 3A Universal, M.D.

MILLING MACHINES—Mfg.
GRAY 84"x22"x16" Planer Miller, 3 heads, Latest Type
INGERSOLL 42"x38"x12" adj. rail, 4 heads, AC, M.D.
INGERSOLL 30x24x12" adj. rail slab, M.D.
SUNDSTRAND Model 3A Duplex 42" feed, Latest

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CINCINNATI 0-S, 1-12, 7-18 Automatic, Latest Type
CINCINNATI 4-36 Hydromatic, Simplex, Latest Type
KEARNEY & TRECKER #2H, 3H, 4H, Latest
KEARNEY & TRECKER 1218, 1404, Simplex, Latest
KEMPSMITH #4 Timken, Latest Type
KEARNEY & TRECKER 4K, Timken, Late

MILLING MACHINES—Thread
MOREY 12x30", 60", 120", 190" centers, Latest Type
PRATT & WHITNEY 4½"x12" Model C, Latest Type
PRATT & WHITNEY 6260" Model C, Latest Type

MILLING MACHINES—Universal
BROWN & SHARPE No. 2A, 4A, Motor Drive
KEARNEY & TRECKER 2H, Timken, Latest Type
VAN NORMAN #26, #36, Timken, Latest Type

MILLING MACHINES—Vertical
BROWN & SHARPE #2 Standard Timken, Latest
GORTON 8D, 8¼D Super-Speed, Latest Type
KEARNEY & TRECKER 2H, 3K, 3H Timken, Latest
MOREY 12M Single & Double Spindle Profiler, Latest
REED PRENTICE 3VG, with or without hydraulic duplicator, Timken bearing, Latest Type

PLANERS
BETTS (CONSOLIDATED) 84"x92"x16' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
BETTS (CONSOLIDATED) 108"x84"x50' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
CLEVELAND 48"x48"x12' Openside, Motor Drive
NILES 108"x84"x12' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
NILES 96"x96"x24' 4 heads, Rapid Traverse, Box Table, D.C. reversing motor drive

PRESSES
BIRDSBORO 225 ton, vert. hyd., Latest Type
CLEARING K-1200-30 Knuckle Joint, 200 ton, 4" stroke, Latest Type
LAKE ERIE 500 ton Vert. Hyd., Latest Type

SCREW MACHINES—Automatic
CLEVELAND 9/16", 1-1/16" Model A, Latest Type
GOSS & DeLEEUW 8" 5 spindle Chucker, Work Rotating, Latest Type

SHEARS—Power
QUICKWORK #5, ⅜" Cap. Rotary Shear, M.D.
QUICKWORK #6, 1" Cap., Rotary Shear, M.D.
WYSONG & MILES #573, 14 gauge x 6' Latest Type

MISCELLANEOUS
AJAX 3⅛" Forging and Upsetting, M.D.
BAKER #5 Keyseater Motor Drive
BARNES #172, 306H, 307, Vertical Hone, Hyd., Self Oiling, Latest Type
CAMPBELL, #401 Abrasive Saw, Latest Type
DE LAVAL #194 Coolant Clarifier, Latest
FOSTER 4"x18", 4"x36" Superfinisher, Latest
HELLER Model 8S-1 Cold Saw, 6" cap., M.D.
LANDIS 2 Single Spdle. Bolt Threader, M.D.
NATIONAL 4" Forging and Upsetting, Latest type
NAZEL #4B Pneumatic Hammer, M.D.
PRATT & WHITNEY (KELLER) Type BL-2416, Type G. Copying 2 and 3 dimensional, Latest Type
STURDYBENDER 5/16"x4' Power Press Brake, Latest

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32" x 144" SPRINGFIELD GEARED HEAD LATHE: NEW 1949, Taper attachment, MD

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No. 24H GOULD & EBERHARDT GEAR HOBBER.

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Giddings & Lewis No. 0, No. 25T.
Lucas No. 31, horiz.
Heald #49 double spindle, #48A Universal 2" horiz. equipped.
Bullard 24", 36", 42" VTL
King 72", 42" vertical

DRILLS AND RADIALS
Barnes No. 242, No. 5 Morse
Carlton 6'-19" column
Canedy-Otto 3'-9" col.
NATCO No. B225H multi-spindle
Cinci-Bickford 21" Box Col. S. S.
Sibley 24"-28", Power Feeds
Hamilton, Langelier, Hi-Speed.

ENGRAVERS
Gorton No. 3U
Deckel GIL, 2 dimen.
Gorton Cutter Grinders 37S-2, 26S-4.

GEAR EQUIPMENT
Barber Colman No. 3 Precision
Fellows #7, 72, 712, 725, 7125, High Speed.
Fellows 645Y Spur & Spiral
Gleason #2 Surface Hardener.
Gleason 8" Spur Bevel Generator
Michigan, Gleason, Fellows Checkers.
Mikron Gear Hobber.

GRINDERS, MISCELANEOUS
Brown & Sharpe No. 5 cyl. 3" x 18", 3" x 12".
B. & S. Nos. 1, 2, 3 Univ.
B. & S. No. 13 Univ. & Tool.
Bryant #16 Internal
Cinn. 12 x 48" Filmatic Univ.
Cinn. #2 Univ. Tool & Cutter
Covel No. 91A Univ. T. & C.
Dalsen Thread, latest
Gardner #226, 80" Disc.
Hanchett #22S Disc. Dbl. opposed w. M.D. Feed.
Heald 72A3 Sisematic Int. Centerless, 81 Internal. 72A5 Sisematic —gaugematic
K.O. Lee Tool & Cutter.
Landis, 10x24" type C Univ., 10x36" angu., centreless
Norton No. 2 Tool & Cutter, Hyd.
Oliver 510 Drill Grinder, Sellers 4G Drill Grinder

GRINDERS, SURFACE
Abrasive No. 33, 34 Vert. 8x24.
Blanchard No. 11, 16" Mag. Chuck.
Blanchard #16A—30" Chuck
Blanchard #18-30" Chuck
G & L Hyd. #25, 6x18", #35, 8x24", #45, 12x24".
Hanchett Model 300, 18 x 48".
Heald #25A Rot. Surf 16" hyd.
Norton 6x18", and 10x36" Hyd.
Reid No. 3A F.F. MIB.
Reid No. 2C Motor Spdl. Hand Feed.
Thompson Hyd. 6 x 10 x 18", 6 x 12 x 18"

LATHES
Bradford 14"x6', G.H. Latest Sebastion 12"x4'
Hardinge Precision, 1" Collet Cap.
Hendey 12" x 42" GH.
Lodge & Shipley 20"x54" G.H. 24 Spindle Speed latest
Monarch 10"x20" EE.

Bliss Double Crank Toggle Press No. 406—48"

Bliss #3½A Toggle Press Geared.
Bliss No. 304A, 306 Straight Side Presses.
Bliss 645B, 650 High Production Presses.
Henry & Wright 75 Ton Dieing Press.

HYDRAULIC PRESSES

DOWN MOVING RAM, SELF CONTAINED

MANUFACTURER	TON CAP.	STR.	OPENING	PLATEN
Lake Erie	500	36"	48½"	35 x 36
H.P.M. Double Action	500	24"	30"	36 x 36
Watson Stillman Shaft Straightener	500	24"	57"	24" bed.
Denison	25/50	18"	23"	22 x 20
Hannifin	50	20"	30"	22 x 30
Southwark, D. A. Clamping Plate	125	30"	2' to 4'	84 x 30
Oilgear Shaft Straightener	35	8"	12"	84 x 11

DOWN MOVING RAM, WITHOUT POWER UNIT

Mesta	750	42"	80"	44 x 44
Chambersburg	300	16"	27"	22 x 36
Southwark	350	42"	78"	28 x 48
Southwark	550	23"	48½"	42 x 32

UP MOVING RAM PRESSES

Watson Stillman	100	8"	11½"	18 x 18
Southwark	600	20"	27" to 48"	34 x 24
Waterbury Farrel	800	6½"	28"	22 x 24
Birdsboro	800	20"	30" to 48"	40 x 32
Watson Stillman	300	12"	21"	24 x 20
Watson Stillman	300	12"	19"	20 x 20
HPM	180	15"	14½"	30 x 30
Dunning & Boschert Molding Press	300	12"	38"	24 x 32 Mold
Stokes Molding Press and Pump	50	7"	24"	20 x 12
Stokes Molding Press and Pump	150	8"	31"	24 x 23
Elmes—With Elec. Plates	50	6"	12"	18 x 18
Stewart Bolling	85	10"	19"	20 x 20

WHEEL PRESSES

NILES — 600 ton 96" 500 ton — 48"; 300 ton — 48.

INJECTION MOLDERS

ACCUMULATORS

Mfr.	Size	Pounds
HPM	6" x 9'	2000
General Electric	15" x 11'	400
Watson Stillman (12 gal) Hydr. Pneu.	42 x 9 x 48"	3000

Monarch 12x30" Dble. Compound, 18", 12"x30" CKK
LeBlond Regal 10"x34½', 13"x24", 15"x30", 16"x48" TA. 19"x48", TA, 21"x60"
LeBlond Heavy duty 16"x30".
Lodge & Shipley 16 x 78" T.A., Collets, etc.

Rivett 608 QCG, TA, Precision
South Bend Q.C.G., 13"x6', 10"x4'

MILLS, PRODUCTION
Brown & Sharpe, No. 000, 12, 21
Cincinnati No. 1-18, 2-18, Mfg., 50-96 hydromatic
Kent Owens IV
U. S. Multimiller, 1 & 2 Spindles.
Sundstrand 00 Rigidmills

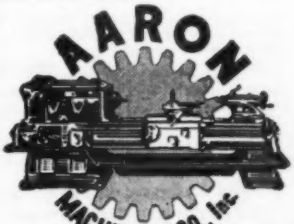
MILLS, PLAIN AND UNIVERSAL
B. & S. No. 2A Univ.
Cincinnati No. 3 Plain, 2M Plain
Cincinnati No. 2MH Univ., H.S.
Milwaukee 2HL, 2H Univ., H.S.
Milwaukee No. 2H Plain, 2 HL
Van Norman Duplex, 6, 20, 36.

MILLS, VERTICAL
Index, Jackson
Brown & Sharpe No. 2 Standard.
Cincinnati No. 4, Hi-Power.
Gorton No. 8D, 9-J Plain.
Morey No. 12M Profiler 2 sp.
Sipp MP5 Jig Borer
Fosdick #30 Jig Borer.
Pratt & Whitney #2 Jig Borer

PRESSES
Bliss No. 18, 19, 20, 21, OBI.
Bliss No. 304A, 4" Str. 23"x24" bed, #306 w. Air Cushion. S.S.
Bliss No. 645B, 650 Hi-Production, 56, 62, 62A, 162.
Bliss No. 4½ Double Action Cam
Colton Tablet Presses.
Gen. Flexible Screw Press.
Henry & Wright Dieing, 75 Ton.
Reliance 45 Ton, O.B.I.
Z. & H. 30 Ton, O.B.I.
Stokes Tablet Presses, Model R & T, DD2.
VNO No. 01

TURRET LATHES
Acme No. 6 W Bar and Chuck, Acme Fox.
Bardons & Oliver No. 3, 1⅛" cap., No. 5, Chuck.
Brown & Sharpe 2F
Foster No. 3B.
Gisholt No. 4, Bar and Chuck, 2L, Saddle Type
Jones & Lamson #5 Univ. Preselector head.
Warner & Swasey No. 3, 4, 5, Preselector, No. 4A 8" Cap.

MISCELLANEOUS
Band Saw: DoAll 36" Zephyr, Tannewitz No. 36M.
Broach: American Horiz. Hyd. H-15-60.
Centering Machine: Sundstrand.
Comparator: J & L 14" pedestal & bench.
Hacksaw: Marvel Nos. 6 and 6A, 9A Automatic Feed.
Marking Machine: Noble & Westbrook
Notching Press: Ferracute C82.
Pin Machine: Nilson.
Profilers: Cinn. 360° 4 Sp., Morey 4M.
Shaper: 24" Rockford Hyd. Heavy Duty.
Cinn. 24" Universal.
Sheldon 12" Brand New.
Honer: Micromatic Hydrohoner, Sunnen.
Keyseaters: Mitts & Merrill, Baker, Burr, Davis.
Lappers: Ultralap.
Rivet Hammers: Hi Speed.
Toolmakers Microscope: Gaertner, Bausch & Lomb, Leitz
Tapper: Bakewell #1, #2
Haskins No. 3C, 3CAM.
Welders: Spot & Seam: Thompson, Taylor, Winfield.
Wrapping Roll: 3/4 Buffalo



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King 34", Vert., 3 SCD, 12 speed
N B P 38-44, Vert.
Bullard 42", Vert. 2 hds on cross rail
Bullard 42" High speed Spiral Drive, Vert., Late
King 52" Heavy Duty Vert., 1 swivel hd. & 1 turret hd. on cross rail
P & H floor type, Horiz., 4" bar
Defiance #6, Horiz., 4½" bar
Hould #49, Single End Boromatic
Gisholt 72", Vertical, 2 hds on rail
Hould #44 Boromatic, 3 heads

LATHES

LeBlond 27" x 90" centers, NEW 1942

American 14"x6', GH 8 speed, M.D.
American 16"x6', High Duty, Cullman Drive
American 16"x8', 3 SCD, Bowl head type
American 16"x8', High Duty, 3 SCD, DBG
American 18"x8', GH Turret on carriage
American 18"x6', 3 SCD, Bowl Head, BG
American 18"x10', 8 speed, M.D.
American 24"x8', GH, M.D., 8 speed, First Class
American 24"x12', GH, M.D., 12 speed, First Class
American 24"x14', GH, M.D., 8 speed, First Class
American 30"x13', GH, 12 speed, First Class Immediate delivery
American 48"x24', raised to swing 62"
American 30"x12', Geared Head, 12 speed
Boye & Emmes 16"x6', 3 SCD, DBG
Boye & Emmes 18" x 8', 3 SCD, DBG, Self Contained
Boye & Emmes 20"x8', 3 SCD, DBG
Hendy 14"x6', 3 SCD Self contained
Hendy 14"x8', Yoke type head, 4 SCD, Drive All
Hendy 14"x6', Model E. B. M. Geared Leg
Hendy 16"x6', 4 SCD, SBG, Yoke head
Hendy 18"x8', Cone head
LeBlond 14"x8', 4 SCD, SBG, Drive All
LeBlond 17"x6', Heavy Duty, SPD, 12 speed
LeBlond 17"x8', 3 SCD, DBG
LeBlond 21"x6', 3 SCD, DBG
LeBlond 24"x16', 3 SCD
LeBlond 25"x12', Heavy Duty, SPD
Lodge & Shipley 14"x30" centers, M.D., 12 speed
Lodge & Shipley 14"x5', 5 SCD
Lodge & Shipley 14"x6', 3 SCD, DBG
Lodge & Shipley 16"x30" centers, GH, 12 speed, Late type
Lodge & Shipley 16"x8', Selective Geared Head, 12 speed
Lodge & Shipley 18"x6', GH, M.D.
Lodge & Shipley 18"x8', 5 SCD, SBG
Lodge & Shipley 18"x8', 3 SCD, DBG
Lodge & Shipley 18"x8', Selective Geared Head, SPD
Lodge & Shipley 18"x8', Bowl head type, 3 SCD, DBG
Lodge & Shipley 20"x8', GH, SPD
Lodge & Shipley 20"x10', Selective Geared Head, 12 speed
Lodge & Shipley 27"x18', Patent Head, 18 speed
Monarch 14"x6', 3 SCD, DBG
Monarch 16"x6', Motor on leg type, 8 speed
Niles Tiemeayer 30"x10' centers, Double Wall Apron
Sebastian 10"x8', 4 SCD

GEAR CUTTERS & HOBBERS

Adams #3 Gear Hobber
Brown & Sharpe #3—30" Gear Cutter, SPD
Brown & Sharpe #5—20" Gear Cutter
Fellows #015 Helical Gear Shaper
Gleason 3" Bevel Gear Generator
Gleason 6" Straight Bevel Gear Generator

MILLERS

Cincinnati #9-S Vert. Mill, with Power Rotary Table—LATE TYPE

Cincinnati 5-30 Plain Hydromatic, First Class
Ohio 48" Tilted Rotary Miller
Van Norman #118 Bed Type, Production Miller
Van Norman #36 Ram Type, Plain Miller, Late
Cincinnati #3 High Power Rectangular Overarm, Plain Miller
Cincinnati #3 Plain Horiz. Miller
Brown & Sharpe #2B Plain Miller
Kempsmith #2 Plain Miller, 4 SCD, SBG
Brown & Sharpe #12, Plain Miller
Brown & Sharpe #2I, Plain Miller, Ohio Overarm
Rockford #2 Plain, back geared high powered
Van Norman #2B, Plain Miller, LATE TYPE
Milwaukee #3-B Plain Miller DRO
Brown & Sharpe #3B Heavy Plain Miller
Cincinnati #3B Univ. Rect. overarm, First class
Milwaukee #2B Universal Miller, SPD, DRO
Cincinnati #3 Universal High Power Miller
Brown & Sharpe #3A Universal Miller
Cincinnati #4 Universal Miller
Brown & Sharpe #4A, Universal Miller, all geared feeds, first class
Newton Heavy Duty Vert., Hydraulic, NEW 1944
Brown & Sharpe #2 Vertical Miller
Cincinnati #4 Vert. High Power Miller, first class

MISCELLANEOUS

Landis 20"x144" External Grinder—Late type
Racine 20 x 20 Shear cut Saw — Late type

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McDONALD
USED MACHINERY

Colburn 52" Hvy. Duty Vertical Boring Mill
G & L and Universal 3" Bar Horiz. Boring Mills
Campbell 9" Cap. M.D. Abrasive Cut-Off Mach.
Moline 6-Sp. Hole Hog Drill, Barnes 4-Sp.
20" All Grd. Camel Back Drill
Cin-Bick 3' & Morris 3½' Arm Radial Drills
Do-All 8 x 24" Horiz. Sp. Hyd. Surface Grinder
Blanchard M.D. Vert. Sp. Surface Grinder 20" chuck
L & S 26" x 8', 18" x 12', 20" x 10', 28" x 12'
Monarch 20" x 8', Amer. 20" x 12' grd. hd. q.c.g. m.d. Engine Lathes
B & S Nos. 2-B & 3-B, Cin. No. 3 Mil, No. 2-B & 3-B, Cin. No. 5 LeBlond No. 4, Grd. Hd. Plain Millers
B & S No. 2-A & 3-A, Mil, No. 2-B, Cin. No. 1-M, Cin. No. 2 Grd. Hd. Univ. Millers
Avey 2-Spindle MAS Drill Press late.
Niagara 12' Power Square Shear, 10-Ga. 18" gap late

MONA MACHINE TOOL CO.
Cin. #3 Vert. Miller Late
Cin. 24" M.D. Univ. Shaper.
Cleveland 48" x 12' Table Open-side Planer, 3 Hds.

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

New & Used Machine Tools For Sale

In Stock—FOR IMMEDIATE DELIVERY

#2AS MILWAUKEE Horiz. Mill. Mach.	$ 675
#3 CONSOLIDATED OBI Punch Press	475
150 Amp GENERAL ELECTRIC Arc Welder	200
#70A HEALD Universal Internal Grinder	850
#1 GARVIN Tapper	125
#3 SIPP Drill Press, 3 spindle, #2 M.T.	350
#2 GARVIN Tapper	250
#1 SIPP Drill Press, single spindle	175
400 Amp HORNET Arc Welder	225
#1 BROWN & SHARPE Vert. Milling Mach.	650
2½ Ton NEW AIR HYDRAULIC Press	395
HC WARDWELL Automatic Band & Hack-saw Grinder	350
12" J & L Hartness Flat Turret Lathe	450
73¾C BLISS Gap Press, 70 Ton, 2" stroke	1,350
20" OHIO Crank Shaper	850
K5 WARDWELL Automatic Bandsaw Filer & Setter	150
7B NEW FRAY All Angle Vert. Mill. Mach.	2,600
#4 COLBURN Mfg. Drill, #5 M.T.	1,750
10" BOICE CRANE tilting Arbor Saw	195

TRI-STATE PRODUCTS COMPANY
1-917th STREET TOLEDO 2, OHIO
MAIN 6228

FOR SALE

#206 Verson 8' Press Brake M.D. 1942
#4 Cincinnati Vert. Miller Hi. Sp. 1941
#11 Blanchard Rotary Surface Grinder
16x54 Monarch Lathe 1948

VICTOR MACHINERY COMPANY
135 So. Clinton St. Chicago 6, Illinois

Latest Type, built new 1941

GRAY 84"x52"x16' Planer Type Milling Machine Power rapid traverse; Distance between housings—85"; Distance under rail—52"; Length of table—16'; Width of table—15"; Diameter of quills 8½"—2 heads on cross rail; 1 side head; 18 spindle speeds 10 to 500 RPM; complete with motor and electrical starting equipment.

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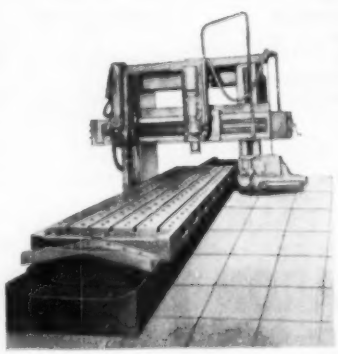
America's largest stock, send for latest catalog.



MOREY MACHINERY CO., INC.
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VERTICAL DRILLING and BORING MACHINES

W. F. & JOHN BARNES VERTICAL DRILLING & BORING MACHINE, 16 spindles driven from base. Original cost over $20,000.00. Practically new. Very late type.
Special Price $3,300.00

Model #28 EXCELLO VERTICAL DRILLING & BORING MACHINE, six spindles, serial No. 22584. Excellent condition.
Special Price $2,560.00

EXCELLO HEAVY DUTY VERTICAL DRILLING & BORING MACHINE, six spindles, serial No. 22780. Excellent condition.
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With our larger Plant and greater facilities for assembly and dismanteling of NOLL REBUILT GUARANTEED MACHINES. Better and more complete equipment cuts down service time and roomy floor space permits the freedom to accurately recondition machinery for dependable and prolonged service.

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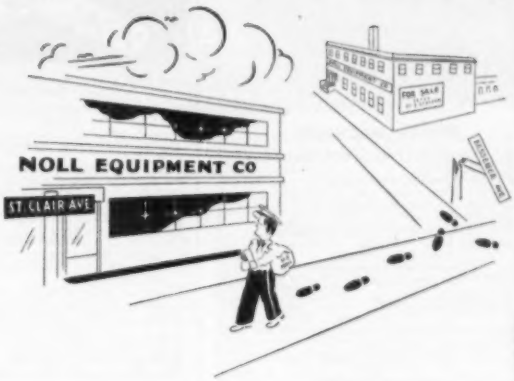

Bullard 42" Vertical Boring Mill

Niles 90" Quartering Machine

Monarch 20"x48" Engine Lathe

Goss & DeLeeuw 7½" 6-Spindle

Hanchett 36" x 48" Model 900-SS

Kearney & Trecker #4K Horizontal Mill

Gleason #3 Spiral Bevel Gear Generator

90% OF THE FOLLOWING MACHINES MANUFACTURED SINCE 1941

AUTOMATICS
Brown & Sharpe #2G Screw Machines
Cleveland 4" S.S. Model "A"
Cleveland 1⅝ S.S. Model A
Cleveland 2½" S.S. Model A
New Britain #16 Chucker
New Britain #61 Automatic

BORING MILLS
Betts 6" Floor Type Horizontal
Bullard 81" Vertical Boring Mill
Cincinnati 44" Vertical Boring Mill
Giddings & Lewis #45 Table Type
Niles 100" Vertical Boring Mill

DRILLS & RADIALS
Allen 6-Spindle Drill Press
American 4' 11" Radial Drill
Avey #3 S.S. Drill Press
Baker #00 HO 12-Spindle Drill
Edlund 4-Spindle Drill
Leland-Gifford 4-Sp. Hyd. Feed
Minster "JR" #12 - 24" Drill
Ridgeway 6' Radial Drill

GEAR EQUIPMENT
Brown & Sharpe 3-26 Gear Cutter
Brown & Sharpe 4-48 Gear Cutter
Brown & Sharpe 6-00 Gear Cutter

GRINDERS
Abrasive #33 Surface Grinder
Arter A1-12" Rotary Surface Gr.
Brown & Sharpe #1 Universal Grinder
Brown & Sharpe #22, 10x30" Cyl. Gr.
Bryant #5 Chucking Grinder
Cincinnati 6x18" Plain Cylindrical Gr.
Cincinnati #2 Centerless Grinder
Covel #15 Surface Grinder
Covel #91-A Univ. Tool & Cutter Gr.
Ex-Cell-O #31 Plain Thread Grinder
Hammond #6, Type B Carbide Tool Gr.
Hammond #10 D.E. Grinder
Heald #22-12" Rotary Surface Grinders
Heald #72-A Internal Grinders
Heald #81 Gagomatic-Sizomatic Grinders
Jones & Lamson 6"x30" Thread Grinder
Landis 6x30", Type "C" Plain Grinder
Landis 10x18" Grinder
Norton 10x36", 45° Cylindrical Gr.
Van Norman 20x48" Crankshaft-ReGrinder

MILLS
Cincinnati #2 Horizontal Mill
Cincinnati #1-18 Climb Mill
Cincinnati 3-24 Hydromatic Mill
Cincinnati #3 Plain M.S.D.T. Horiz. Mill
Hardinge Vert. & Horiz. Mills
Index 22" x 8" Milling Machine
Kearney & Trecker #1M Horizontal Mill
Kearney & Trecker #2 Special Mill
Kent-Owens #1M Hand Mills
Lees-Bradner 12x36" Thread Mill
Products Model "M" Hand Mill
Van Norman #2SU Universal Mill

LATHES
American 24" x 7' Engine Lathe
Bardons & Oliver #5 Turret Lathe
Betts-Bridgeford 30" x 8' Centers Lathe
Boye & Emmes 24" x 6' Lathe
Bradford 10" x 54" (8' Bed) Lathe
Gardner #3 Plain Polishing Lathe
Gisholt #5 Turret Lathe
Hendey 24" x 72" B.C. Lathe
Jones & Lamson #5 Turret Lathe
LeBlond 21" x 7' Engine Lathe
Lodge & Shipley #3A Duomatic Lathe
Lodge & Shipley 12" x 30" Engine Lathe
Porter Cable Carbo Lathe
Reed-Prentice 14x30" (6 Bed) Lathe
Ryerson Engine Lathe 24" x 8'
Warner & Swasey #2 Turret Lathes
Warner & Swasey Turret Lathes #3A
Wicks 38 x 10' Bed Engine Lathe

PLANERS
Pond DH 60" x 72" x 18' Planer
Cincinnati DH 36" x 36" x 20' Planer

PRESSES
Bliss #30315 S.S. 35-Ton Punch Press
Ferracute 100 Ton S.S. Punch Press
HPM 100, and 150 Ton Hydraulic Presses
Minster 100-4-60, 32"x60" Power Screw Press
Toledo #41 Herring & Wiring Press

SAWS
Cochrane-Bly #55 Cold Saw
Do-All V-18 Band Saw

SHAPERS
Fellows #61 Gear Shaper
Pratt & Whitney 6" Vertical Shaper
Smith & Mills 10" Horiz. Shapers

SLOTTERS
Betts 18" Slotter

MISCELLANEOUS
Ajax 2" Header (Upsetter)
Bakewell #1 Tapping Machine
Cincinnati 2-48 Hydro. Duplex Vert. Broach
Colonial VB16-24 Vertical Broach
Detroit Top Reconditioner
Elwell-Parker Boom Crane
Foster 4" x 18" Superfinisher
Manville 150-Ton Header
Taylor-Winfield Spot Welders
Tolhurst Solid Curb 25" Chix Wringer

WRITE, WIRE OR PHONE EXPRESS 1-0700

Noll EQUIPMENT CO.
4537 ST. CLAIR AVE.
CLEVELAND 3, OHIO

AUTOMATICS

⅞" and 1¼" Cone 4 spindle.
1-1/6" Cleveland Model M.
1⅛" Greenlee 6 spindle.
1⅞" Conomatic 8 spindle.
2"x18" Cleveland Model B.
4½" Conomatic 4 spindle.
No. 16 New Britain 6 spindle chucker.
No. 454 New Britain 4 spindle chucker.
No. 5 DE 2 Potter & Johnston chucker.
8" Bullard Multomatic 6 station.
14"x18" Monarch Mag-na-Matic.
14"x19" Fay.
1" Economy hopper feed shaver.

BORING MACHINES

100" Niles-Bement-Pond vertical, extra heavy.
52" King vertical.
36" Bullard vertical turret lathe.
5" Jones floor planes type horizontal.
4½" No. 33 Lucas horizontal.
3¾" No. 32 Lucas horizontal.
3½", No. 32 Giddings & Lewis horizontal.
3", No. 31 Lucas horizontal.
3" No. 3A Universal horizontal.
Nos. 47A & 48A Heald Borematics.
No. 42 Heald Borematic.
No. 712 B Ex-Cell-O.
No. DB 2112 Ex-Cell-O.
No. 1212A Ex-Cell-O 4 spindle.
Vernon vertical miller or jig borer.
Munson double end horizontal.
No. 4 HH Baker 2 way horizontal.

ENGINE LATHES

10"x20" Monarch model EE
14"x6' Lodge & Shipley
16"x5' Sebastian
16"x10' American.
18"x6' Lodge & Shipley.
18"x8' Rockford.
19"x8' LeBlond.
20"x8' Lodge & Shipley
25"x48" centers LeBlond.
30"x16' LeBlond.
36"x16' Bridgeford.
40"x15' LeBlond heavy duty.

TURRET LATHES

Nos. 2, 4, 1A & 3A Warner & Swasey
No. 7 Bardons & Oliver.
Nos. 3, 4, 5 3AL & 28" Gisholt.
No. 4 Midland.
No. 6.2 Denver.
24" & 36" Bullard vertical.
3"x36" & 4"x34" Jones & Lamson.
Nos. 2G Morey.
No. 5 Foster.

MILLERS

No. 2H Kearney & Trecker universal.
No. 3 Cincinnati universal.
No. 3 Van Norman Duplex.
Nos. 2AS & 3B Milwaukee plain.
No. 3 Cincinnati MSDT plain.
No. 3 Ohio plain.
Nos. 2H & 3H Kearney Trecker vertical.
Nos. 2, 3 & 4 Cincinnati dial vertical.
No. 3V Van Norman vertical.
No. 3 Kempsmith Maximill vert.
No. 4 Cincinnati H.P. vertical.

SHAPERS & PLANERS

16", 20", 24" & 28" G&E shapers.
20" x 24" Gemco univ. shapers.
24" Columbia univ. shapers.
6" Pratt & Whitney vertical shaper.
30"x24"x6' Liberty openside planer.
36"x36"x8' Gray planer.

MISCELLANEOUS

BALER, No. 23P-60 Logeman hydraulic.
BROACH, 10T, 36" stroke Colonial surf.
DRILLS, 121, 217, 314A, 315, 30H Baker.
GEAR HOBBERS, 8H, 12H, 16HS, 18H G&E.
GRINDER, 12"x36" Cincinnati univ.
GRINDER, No. 34 Abrasive surface.
HAMMER, No. 5N Nazel air.
HONER, No. 307 Barnes.
LAPPER, No. 26F Norton Hyprolap.
PROFILER, No. 12B Pratt & Whitney.
PRESS, 1000 ton Bliss coining.
PRESS, 600 ton Hamilton forging.
PRESS, 1000 ton Baldwin hydraulic
TAPPER, Baush radial arm.
TAPPER, No. 1 Bakewell.
THREADER, 1½", No. 11 Murchey.
UPSETTER, 2" National, 4" Alex.
WELDER, 200 KVA Federal flash.

MILES MACHINERY CO.
BOX 770 SAGINAW, MICHIGAN

LATHES

Bridgeford 26" x 50', 15 spd. gr. hd. 38" swing 48' C.D. mtrzd. carriage.

Monarch 20" x 72" centers model "M", 16 spd. gr. hd. 22½" swing, Monarch auto, sizing controls (late).

Niles-Bement-Pond 48" x 20' centers—Quick change Gr.—Gr. Hd., Heavy Duty, A.C. Motor Drive—2 carriages—Taper attachment—power rpd. traverse—16 spds. 2.04 to 90 RPM—used short while

BROACHES

Lapointe #3¼-L Horiz. Hyd. Var. Speed 62,000 lbs. peak pulling capacity—64" stroke (used short while)

Lapointe #2L horizontal hydraulic variable speed (1943 mach) 37680 lb. peak pulling cap., 52" stroke, 10 HP AC motor and complete controls (like new)

American V-2, 12 ton Hydraulic vertical press and broach (1945 machine) 28" stroke, 15 HP AC motor and complete controls

GRINDERS

Norton 10" x 72", Type "C" Hydraulic Grinder (1943 Mche).

Farrel 30" x 182", M.D. roll grinder, max. face ground 182".

RADIAL DRILLS

Fosdick 5'17" and 5'15" motor-on-arm "Economax" hydr. #6 taper, very late.

American 4'12" triple purpose M.D. #4 taper 24 speed

American 5'13" full universal M.D., #5 Morse taper.

SHAPERS

Rockford 24" "Special" Hydraulic Plain table, 10' to 140'/min. cutting speed—26" max. stroke—rapid traverse to table—power elevation to table—actual use less than 25 hours.

Stockbridge 20" M.D. Bk. Gr. crank Universal

Hendey 20" M.D. 4—Speed Motor (Fetry mtzed)

PLANERS

Niles 1½"x24' capacity plate planer, 10 HP AC motor drive

Cincinnati 72"x42"x16' M.D. dbl. housing, 2 rail hds., 2 side heads

Gray 36"x36"x14' M.D. extra hvy. pattern, dbl. housing, 2 rail heads, 1 side head

BORING MILLS

Lucas #33, 4¼" bar, face plate to outer support 84", #6 Morse taper, A.C. motor drive.

Lucas #33-4½" Bar Precision A.C. motor drive—extended bed—high speed vert. milling attachment—36" rotary table—added vert. range—#6 Taper—face plate to outer support 9'

Complete Your Machine Tool Files
Send For Complete Listings

Botwinik Brothers
Main Inc.
PHILADELPHIA 7, PA. SHERMAN ST. & GIRARD AVE.

PLANERS FOR SALE

Gray 48"x48"x16' Planer, 2 rail heads and 2 side heads, power lift to rail.

PRICE $2,500.00

Gray 42"x42"x12' Planer, 2 rail heads and 1 side head, power lift to rail.

PRICE $1,750.00

VERY GOOD CONDITION

WINSTON MACHINERY CO., INC.
517 S. Delaware St., Indianapolis 4, Ind.

LATE MODEL TOOLS

4'9" AMERICAN "Hole Wizard" Radial

4'11" CINCINNATI BICKFORD "Super Service" Radial

5'15" FOSDICK "Economax" Radial

No. 4H K&T Universal Miller, 1943

No. 2BL NATCO "Holesteel" Multiple Spindle Drill, rectangular head.

Model W-7 BAUSH Hydraulic Multiple Spindle Drills.

16"x30" and 54" MONARCH TOOLROOM Lathes.

20" G&E Industrial Shaper.

Nos. 3 & 5 JONES & LAMSON Ram Type Universal Turret Lathes

32"x24"x120" ROCKFORD Hydraulic Shaper Planer, 3 heads

No. 3B B&S Dual Control Plain Miller

No. 145 CLEVELAND Rigid Hobber

WIGGLESWORTH MACHINERY COMPANY
230 Bent Street, Cambridge, Mass.

AUTOMATIC—#00G Brown & Sharpe, 10,000 serial
BORING MILL—38/44" Niles Bement Pond Vertical-Sidehead
BORING MILL—48" Gisholt Vertical—2 Rail Heads
DRILL—8 Spindle Natco Straightline
GRINDER—#14A-20 Gardner Opposed Wheel—late
GRINDER—#G-8 Porter Cable Abrasive Belt
GRINDERS—#44 & 48 Excello Carbide Tool, late
GRINDER—5"x40" Landis Cam Contour, late
LAPPERS—#26C & 26F Norton Hyprolaps, late
LATHE—14"x6' cc Lodge & Shipley Geared Head
LATHE—16"x6' Carroll Jamieson Geared Head, late
LATHES—13" & 17" LeBlond Rapid Production, late
MILL—Van Norman Hand, late
PLANER—42"x42"x14' NBP, 4 heads, DC, MD
SHEAR—#208A Niagara Circle Shear & Flanger
WELDER—50 KVA Federal, Press Type, Air Operation

ALEXANDER & FIDEN MACHINERY CO., INC.
7 Austin Street Buffalo, New York

#3B Abrasive 8"x24" Grinder, 1942
#91A Covel Tool and Cutter Grinder, 1941
#1-18 Cincinnati Plain Auto. Mill, 1942
26" De Laval Chip Wringer, 1943
14"x18" LeBlond Heavy Duty Lathe, 1942
1⅛" Four-Spindle Conomatics, 1941 (5)
#2 Warner & Swasey Turret Lathe, 1941

BARRON MACHINERY COMPANY
113 South Clinton St. Chicago 6, Illinois

MACHINERY FOR SALE
ATTENTION EXPORTERS!

Unusual opportunity to procure modern Fellows Gear Shapers 615A and 645 as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher, #7 Fellows Gear Shaper, #18 D. E. Whiton Machine. Write for full information.

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Every Item Guaranteed as Represented

AUTOMATIC SCREW MACHINE, #00 Brown & Sharpe, Cap. 5/16", Slotting Attachment, Coolant System, etc. THREE.
AUTOMATIC SCREW MACHINE, #00 Brown & Sharpe, Cap. 5/8", Slotting Attachment, Coolant System, etc. TWO.
AUTOMATIC SCREW MACHINE, #2 Brown & Sharpe, Cap. 1", Collet, Collet Chuck, tailposts, Coolant System, etc. FOUR.
AUTOMATIC SCREW MACHINE, #2B Brown & Sharpe, Cap. 1", 2 h.p. 220/440 volts, Collet, Collet Chuck, Coolant System, etc. THREE.
BORING MILL, Betts 100" Vertical.
BORING MILL, Bullard 56" Vert. Spiral Drive.
BUFFER & POLISHER, U. S. Electrical Multi-Speed Double End #95, 5 h.p., 220 volts, Four Speeds up to 2700 r.p.m. Floor model.
DRILL, Avey-Maile #3 Hvy. 2-Spdl. #3 M.T. 24". 15" C.C.
DRILL, Barnes 24" Self-Oiling, #3 M.T.
DRILL, Buffalo 26" #2MB Bord. #3 M.T.
DRILL, Cincinnati 21" Bord. Drilling & Tapping.
DRILL, Radial, Cinci-Bick. 3' Arm, 9" Col. #4 M.T. 12 speed gearbox. 3 h.p. 3/60/220.
DRILL, Radial, Cinci-Bick. 5' Arm, 13" Col. #5 M.T. 24 speed gearbox. 7½ h.p. 3/60/220.
DRILL, L. C. Gifford #2MB, 14". 11" C.C. 3-Spdle
DRILL, Baker #314 Hvy. Pattern High Speed Vertical Boring & Drilling Machine. 7½ h.p. 220/440 motor, #5 taper, 12 feeds, 6 speeds, 12¼" throat. 3" Capacity in steel.
DRILL, Leland Gifford #2LMB Upright Sliding Head Two Spindle, #2 taper, 13" overhang, Independent 220 volts, 4-speed motors. Indicated spindle speeds.
DRILL, Natco #12 Multiple Spindle Motor Driven, #1 taper, 3 h.p. 220/440 motor, Arranged for 18 spindles, Rectangular head, With Natco 24" Rotary Table.
STRAIGHT BEVEL GEAR GENERATOR 5" Gleason, Serial #18694, NEW—1942. 220/440 volts motors. Gear Cabinet, Full Set of Index Gears, Segments, Auto-Index Attachment, Pneumatic Chuck Equipment, Cutter Setting Gauges & Segment Setting Gauges, Duplate Cutting Cam & Duplate Feed Cam.

PARTIAL LISTING OF LARGEST STOCK IN THIS AREA

BASE PITCH & SPACE MEASURING MACHINE, #337 Illinois, Late Type—Like New. Capacity—12" diameter gear, 15" between centers. Full Set of Off-Set and Straight Contact Fingers, Dial Indicator, Tailstocks and Leatherette Cover.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.
GRINDER, Cincinnati #EA, 10" x 30" Hydraulic Cylindrical, Filmatic Bearings, 220 volts motors. Built-in electrics, Hydraulic Infeed.
GRINDER, Cincinnati #2 Universal Cutter & Tool, Model #EM. New in 1943, 220/440 volts motors. Cylindrical Grinding Attachment & lot of Equipment.
GRINDER, Covel #7B. 6x24 Hydraulic Horiz. Surface.
GRINDER, Norton 6x18 Hydraulic Vert. Rotary Auto. Exello Spdle.
GRINDER, Norton 6x18 Hydraulic Horiz. Surface. Exello Spdl.
GRINDER, Pratt Whitney 22" Vert. Rotary. 84" table travel.
GRINDER, Reid #2-B All-Electric 6x18 Auto. Horiz.
GRINDER, Thompson 6x18 Hydraulic Horiz.
GRINDER, Bath 10"x25" Motor Driven Universal Surface, 220/440 volts motor with centralized push button controls, Internal Grinder Attachment & Heads, Rest, etc.
KEYSEATER, Mitts & Merrill #5 Giant Motor Driven, 220/440 volts motor, Capacity—24" long, 3" wide keyway, Automatic Feed.
LATHE, LeBlond 30" x 30', 220/440 motor, 12 speed head, taper attachment, steady rests, etc.
LATHE, Hardinge #59 High Speed Second Operation Machine, 1" Collet Cap, Automatic Collet Mechanism, collets, solid chucks, etc. FOUR.
TURRET LATHE, Bardons & Oliver #7 Universal Grd. Hd. Ram Type, Hydraulic Speed Selector, 2½" Cap. 10 h.p. 220/440 motor, With Chuck, toolholders, etc.
TURRET LATHE — Warner Swasey #1-A Model #M-470 Universal 12 Speed Grd. Hd. Hvy. Duty Bar Feed Saddle Type, Cap.—2¼", Power Screw Bar Feed & large lot of tooling, 220/440 volts.
MILLING MACHINE, Cincinnati #3 Vert. H.S. Dial Type.
MILLING MACHINE, U. S. #MMI-6 Cam Controlled Automatic Horizontal, #40 taper, Late Type, 220/440 motors. TWO.
MILLING MACHINE, Cincinnati #3 Dial Type High Speed Motor Driven Horizontal, 220/440 motor, Range: 24" x 12" x 20".
MILLING MACHINE, Van Norman #3V Ram Type Vertical, Late Type, 220/440 motors. Also stub arbors, arbor, vise, collets & cutters.
POWER PRESS, Bliss #84 S.S.S.A. 55 tons, 10" Stroke, 20" between uprights.
POWER PRESS, Bliss #75½ S.S.S.A. 120 tons, 5½" Stroke, 24" between uprights.
POWER PRESS, Bliss #54 S.S. Dble. Crank S.A. Grd. 45 tons, 4" stroke, 30" between uprights.
POWER PRESS, Niagara #38 Back Flywheel, 67 Tons, 3" stroke, 10" shut hgt. 12"x14" hole thru bed, 28"x18" bed area.
WHEEL PRESS, Niles B & Pond 200 Tons Hydraulic Horizontal, 48" between strain bars, Two Plunger Type, 7.5 h.p. 220/440 motor.
POWER PRESS, Bliss-Consolidated #77 Open Back Gap Frame Dble. Crank Gate, Action Back geared, 175 tons, 10" stroke, Bed area—24" x 42", With Roll Feed and Roll Straightener.
POWER PRESS Ferracute #36 Double Crank Gate, Action, S.S. Geared, 85 tons, 1¾" stroke, Bed area—61½" x 27¾".
POWER PRESS — Bliss - Consolidated #163 - H Straight Side Dble. Crank Gingle Action, 45 tons, 9" stroke, Bed area—24" x 41", 15 h.p. 220 motor.

LATHE — Engine, Monkintosh-Hemphill 72"/110"x30' centers (1943)
HYDROTEL — Cinc. Vert. Mill #2B/60, 4 spindles, tracer (1942)
O.E.T. CRANES—(2) 10 Ton x 62' span, floor control (NEW)

BORING MILLS—D & H 3½" horiz., floor (Bargain) Bullard V.T.L. 24", side head, Serial #11,165
FLATHER— 30" Vertical Turret, (1 hd.), (old).
DRILL PRESS—Minster #2D, heavy duty, 2½" cap.
MILLERS—B. & S. No. 3 Universal (old)
Cinci. #3 Vertical Hi Power
Newton Vertical 24"x42" rotary (Rebuilt)
PLANERS—N.B.P. 48"x48"x26'—4 Heads
Hamilton 36"x36"x10'—3 Heads, closed
ROLLS—BENDING—H. & J. 30"x¾", Pyr.
Southwark 15'x3", Pyr., Vertical
Angle-Bertsch, 3"x3"x⅝", Initial
SHAPER—G. & E. 24", back geared (Bargain).
SHEAR—Alligator (#2) 24" Blade, 3" Rds., etc.
THREAD MILL—Morey 12"x10' centers (1942)
PRESSES—Z & H #7—50 ton Percussion
Bliss #6—125 ton (1942), Bliss #76½—450 ton (8" stroke
HYD. PRESS—375, 500, 675, 750, 3000 ton

KINGS COUNTY MACHINERY EXCHANGE
408 Atlantic Ave., Brooklyn 17, N.Y.
Dept. "A" TRiangle 5-5237

P & W 36" Measuring Machine
No. 2B B & S Plain Mill
Cincinnati No. 2 Centerless Grinder
Horton No. 2 Tool & Cutter Grinder

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

LATE MODEL MACHINE TOOLS . .

AUTOMATICS
No. 065 New Britain Chucker, 1947.
12"x21" Fay Automatic, 1942.

BOLT MACHINES
No. 500C Manville Thread Roller. Latest.
No. 250C Manville Header, 888D. Latest.

BORING MACHINES
62" King Vertical, 1942.
47A & 48A Heald Single End, 1943.

DRILLS, RADIAL
4'11" Canedy-Otto, 1943.
6' 15" American Hole Wizard, 1941.

GEAR EQUIPMENT
12" Gleason St. Bevel Gen. 1942.
No. 6 Gleason Ravenvie, 1941.
No. 6 & 17 Gleason Testers, 1943.
8" Red Ring Internal Shaver, Late.
No. GCL Red Ring Shaver, 1942.
No. 645A3, 615A & 81A Pellows, 1944.
No. 72 Fellows Shaper, 1943.
Red Ring Univ. Checker.

GRINDERS, CYLINDRICAL
25" x 48" Landis, Crankshaft. Like New.
16" x 36" Cincinnati Plain, 1942.
12" x 30" Landis Univ. 1941.
10" x 72" Landis Plain, 1942.
10" x 18" Norton Plain, 1943.

GRINDERS, INTERNAL
No. 72A3 & A5 Heald Rotary, 1943.
No. 73 Heald Hydraulic, 1942.

LATHES, ENGINE
45" x 192" Avalon, 1942.
27" x 96" LeBlond, 1942.
16"x54" American Pacemaker, 1943.
16"x54" Reed-Prentice, 1942.
14" x 30" Bradford, 1942.

LATHES, PRODUCTION
No. 3A LS8 "Duomatic", 1943.
8" x 108" Le-Swing Semt. Auto. 1942.
Model 16 Sundstrand, 1942.
14" x 48" Monarch "Magna-Matic", 1941.

LATHES, TURRET
42" x 36" Bullard Vertical, 1943.
No 3A Warner & Swasey, 1941.
No. 4A Warner & Swasey, M.D.
No. 1 & 6¼" x 24" Acme Univ. 1943.
No. 2 & 4 Warner & Swasey, 1942.
No. 3, 5 & 7 Hardens & Oliver, 1942.
No. 3R Gisholt, 1942.
No. 2H Libby, Late.

MILLS, PLAIN
No. 3B Brown & Sharpe, 1941.
No. 5 Cincinnati, 1942.
No. 3M Van Norman, 1942.
No. 2S Van Norman, 1942.

MILLS, PRODUCTION
No. 1-14 & 2-20 Kent Owens 1943.
M-18 Kearney & Trecker, 1943.
No. 1224 Kearney & Trecker, 1942.
No. 2-36 Cincinnati Duplex, H. & F. 1942.
No. 3-36 Cincinnati Hydromatic, 1942.
No. 1-18, 2-18 & 2-24 Cincinnati, 1942.

MILLS, THREAD
12" x 54" Lees Bradner, 1943.
6" x 36" Lees Bradner, 1942.
4" x 9" Hanson Whitney, 1942.

MILLS, UNIVERSAL
No. 2MH Cincinnati, 1943.
No. 2H Milwaukee, 1942.
No 2SC Van Norman 1942.

MILLS, VERTICAL
No. 2H Milwaukee, 1942.
No. 2 Cincinnati, 1942.
No 1 Cleveland 1942.

PRESSES
50 Ton Denison Hyd., Str. 1942.

SHAPERS & PLANERS
20" Cincinnati Plain, Late.
23" Smith & Mills Univ. 1943.

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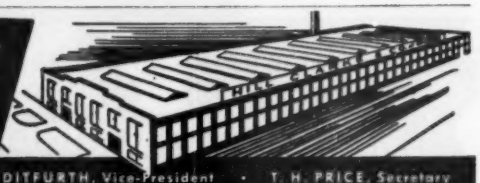

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AUTOMATICS
No. 49 New Britain, 4 Spdl. Chucker
Model A 3¼" Cleveland (1942)

DRILLS
No. 150 Baker
No. D8 Colburn, No. 6 Morse Taper
No. 200—26" Defiance #5 Taper (1943)
No. 4—B Edlund S.S. No. 3 Taper
No. 1-LMS Leland-Gifford (1942)
No. 2-LMS Leland-Gifford (1942)
No. 4BL Natco 36 Spdl. (1943)
3'-10" American Triple Purpose, M.D.
5' Western Heavy (1942)
6'-17" Fosdick Hyd. Economax Radial

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 72 Fellows Gear Shaper
No. 16 HS Gould & Eberhardt
No. 12 Gleason Bevel Gear Generator
72" Cincinnati Gear Cutter
No. 3 Barber-Colman Hob Sharpener

BORING MACHINES
No. 31 Lucas 3" bar, M.D.
No. 32 Giddings & Lewis, 3½" Bar
No. 2 Lambert 4" bar
No. 46-B Heald Bore-Matic (1942)
No. 112—C Excello 2 Spdl. (1942)
24" Bullard
36" Bullard
42" Bullard New Era
60" Colburn, M.D.
72" Niles-Bement-Pond
84" Betts, M.D.

GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
4"x18" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
10"x36" Landis Type C hydraulic (1942)
Norton Motorized Grinders ranging from 6"x18" to 18"x96"
No. 3 Abrasive Surface Gdr.
No. 34 Abrasive Surface Grinder (1943)
No. 11-16 Blanchard
No. 72-A-3 Heald Internal (1942)
No. 72-A-5 Heald Internal (1942)
No. 16—38 Bryant Internal Gdr.

LATHES
18"x8' American, Gdr. Head, M.D.
18"x8' American Gd. Hd.
24"-27"x22' Lodge & Shipley
36"x16' Betts—Bridgeford Grd. Head
36"—48"x16' Lehman Hydratrol (1945)
8"x15" Sundstrand, Model B (1943)
10"x22" Sundstrand, Model AA (1943)
18" Fay Automatics (1942)
Model R-14 Seneca Falls Lo-Swing
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4B Libby, Bar Feed (1942)
No. 5 Bardons & Oliver (1942)
No. 1-H Libby, Extra Long Bed (1942)

MILLING MACHINES
No. 3B Milwaukee Plain
No. 5 Cincinnati H.P. Plain
No. 3 Cincinnati Universal
No. 2M Cincinnati Vert. (1941)
No. 2 Cincinnati Dial Type Vertical (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-16 Cincinnati Mfg. (1942)
No. 2—18" Cincinnati Rise & Fall (1941)
No. 2—18" Sundstrand-Electromil (1942)
No. 3-24 Cincinnati Hydromatic (1942)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 45-48 Cin. Hyd. Tracer (1941)
No. 56-72 Cincinnati Hydromatic
No. 56-90 Cincinnati Hydromatic
4½"x12" Pratt & Whit., Model C Thread Mill
6"x36" Lees-Bradner—Model LT (1943)
10"x48" Hanson-Whitney Thread (1942)
12"x24" H.T. Lees-Bradner (1942)
36"x24"x12' Ingersoll Duplex Miller (1946)
No. 10 Ingersoll 72"x8' Travelling Col. Face Millers (1942)
No. 28-60 Cincinnati Hydrotel
No. 36—120 Cincinnati Horizontal Hydrotel

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36" Ohio Shaper
18" Dill Slotter
Micromatic Vertical & Horizontal Hydrohoners

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36"x36"x12' Cincinnati
36"x36"x18' Gray Maxi Service, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads
144"x76"x48' Liberty Openside Planer

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No. 3Z Gorton Pantograph Engraving Machine with roll die att.

12"x12" Type DA Dings Magnetic Chip Separator.

No. 40-5 Minster S.S.—D.B.G. Press. 16" stroke.

No. 4 LaPointe Broach. 50 ton capacity.

50 Ton Henry & Wright Dieing Machine.

10"x18" Cincinnati Model EA Grinder, serial #5P2A1L-13.

No. 5-60 Cincinnati Hydromatic Production Mill.

No. 5 Loshbough Jordan B.G.—O.B.I. Punch Press. M.D., 4½" stroke.

1½" Conomatic Automatic Screw Machines, late. (3)

No. 2G Brown & Sharpe H.S. Aut. Screw Machine, serial #10815. 1½" cap.

20" Ohio Shaper (1943)

No. 3¼ Bliss S.S. Toggle Press

No. 6 Bliss S.S. Tie Rod

No. 174 Toledo Tie Rod Toggle Press

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15" Gleason Quenching Press
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500 Ton Erie Hyd. press 40x54", 28" st.
8"x108" LoSwing Lathe, AC motors
4—5" Gleason Strait Bevel Gear Generators

#17 Gleason Hypoid Gear Grinder for fast precision finishing of hardened spiral bevel, zerol bevel, & hypoid gears & pinions.

6x18 Norton Pl. Cyld.
1404 K & T bed type prod. mill, late type
34/36 Cinc. Hydromatic Duplex mill, late
#4 W & S turret lathe, bar & chucker ser. 757384
Model 2L Gisholt 16" turret lathe
30 HO Baker Drill inverted

96" Ohio Extra Heavy Duty rotary table hand & power feed.

10x36" Cinc. "EA" Hyd. Cyl. Grinder, late

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5'-11" Carlton, m.d. on arm, latest
5'-13" Cincinnati-Bickford, m.d.
5'-14" American Triple Purpose, m.d. on arm
5' Cincinnati-Bickford Full Universal, gear box
5' Cincinnati-Bickford Plate Hole Driller, m.d. on arm
5' Prentice, m.d., Plain
6'-15" American Hole Wizard, m.d. on arm
6'-15" Carlton, gear box, inclosed head
6'-15" Cincinnati-Bickford, with 7' arm, m.d.
6'-15" Foodick, variable speed m.d. on arm
6' Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western, m.d.
6'-17" American Triple Purpose, m.d. on base
7'-17" Dreses, gear box, m.d.
8'-16" American Triple Purpose, m.d. on arm

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20" Barnes All Geared, m.d., tapper
20" Cincinnati, belt drive
21" Cincinnati, belted m.d.
21" Cincinnati-Bickford, m.d., tapper
21" Cincinnati-Bickford, belt drive
24" Cincinnati-Bickford, m.d.
25" Foodick, H.D., s.p.d.
25" Foodick "Economax", m.d., tapper
30" Rich, H.D., m.d.
32" Aurora, belt drive
No. 25 Foote-Burt, m.d.
No. 36NO Baker H.D., m.d.
D4 Colburn H.D., m.d.
D8 Colburn H.D. m.d.
No. 221½ Barnes All Geared, m.d., latest type
No. 217 Baker H.D., s.p.d.
B225H Natco H.D., m.d
C225H Natco H.D., m.d.

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No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 01 Fellows, belted m.d.
No. 01A Fellows, m.d., latest type
No. 04S Fellows, m.d.
No. 04SA Fellows, m.d., late type
No. 04S Fellows, m.d., latest
No. 04S Fellows, belt
No. 712S Fellows, m.d., late type
No. 72 Fellows, m.d., latest
No. 73 Fellows, m.d.

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9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical, m.d.
No. 2NS Lees-Bradner Spur & Helical, m.d.
No. 13LS Fellows Gear Lapper, m.d.

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Type A Barber-Colman, m.d.
No. 3 Barber-Colman, m.d. in base, latest
No. 3 Barber-Colman, motor mounted on top
No. 12 Barber-Colman, Single Overarm, m.d.
No. 12 Barber-Colman, Double Overarm, m.d.
No. 12H Gould & Eberhardt Universal, m.d.
24H Gould & Eberhardt Universal, m.d., latest
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, Spur & Spiral, m.d.

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Gleason Spiral Bevel Gear Roughor, s.p.
3" Gleason Straight Bevel, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
Cross Gear Tooth Rounder, m.d., 9" cap.
National Broach & Machine Co. Red Ring Gear Speedor, 19" cap.

GEAR TESTERS

Gleason Gear Tester for hypoid Gears
No. 1 Brown & Sharpe Spur Gear Tester
No. 4 Gleason Angular Hand Rolling Tester, m.d.

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No. 2 Cincinnati, m.d., Filmatic Spindle, latest
No. 2 Cincinnati, m.d., older type
No. 3 Cincinnati, m.d., Filmatic Spindle, latest
Cincinnati Valve Seat Grinder, cap. ⅝" valve stems, m.d.

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No. 55 Heald, m.d., 15-24" spindle
No. 73 Heald, m.d., brand new, latest type Airplane Grinder

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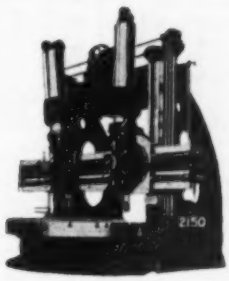

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30"x18" LEBLOND Universal

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PORTER CABLE Belt, B.G.S
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16/26"x26" NORTON Cyl.
10"x24" LANDIS Cyl. Universal
10"x18" NORTON Cyl.

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250C SSSD R & G Late

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No. 0-8 CINN. Plain
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No. 2 MH CINN. Universal
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No. 56-96 CINN. Hydromatic
6 spindle CINN. Hydrotel Vert. Tracer Attach.
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No. 3 CINN. Dial High Speed. Vertical

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No. 1 BAKEWELL Tapper
No. 1 and No. 3C HASKINS Tappers
CHARD Production Lathe, Size 16½
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48"x48"x16' GRAY double hous. Planer
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Bullard Multaumatics, 16", 12", 8", late
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Sibley (1941) Drill Presses, #5 M.T.
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Hardinge Multipurpose Chucking Machine, 1950
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20"/40"x10' NEBEL Sliding Bed Gap Lathe, Geared Head
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36"x30' bed LODGE & SHIPLEY Selective Geared Head Lathe, raised to swing 50", 22' centers, 2 carriages
No. 4A WARNER & SWASEY Turret Lathe, quick change gearbox, full length leadscrew, 1942
16"x40" R-14 SENECA FALLS Lo-Swing Lathe
4' HAMMOND Jackknife Radial, 1942, electric tapping attachment
No. 5BM FOSDICK 4 Spindle Drill, power feeds to all spindles, 1942
84" CONSOLIDATED COLBURN Vert. Boring Mill, 2 swivel heads, rapid traverse, AC—MD
No. 3 CINCINNATI (Dial Type) Plain Mill, Vert. Head, 1941
No. 31 LUCAS, 3" bar, Horizontal Boring Mill
24" GOULD & EBERHARDT Shaper, rapid traverse, power downfeed, factory, MD
10" PRATT & WHITNEY Vertical Shaper, MD
No. 9A MARVEL Automatic Hacksaw, 10"x10" gap, bar feed, MD
No. 512 NIAGARA Straight Side Press, 280 tons, MD
No. 3½ BAKER Keyseater, cuts 4½" keyways, AC-MD
10'—¾" Pyramid Bending Rolls

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No. 25T G. & L. 2½" table Hor. Mill, 1942
3" Univ. Table Mill, 40" vert., 72" hor., '43
4" Univ. Table Mill, 60" vert. 96" hor., '43
36" & 42" Kings Side Hd. Vert. Mills, '43
Nos. 1A & 3 W. & S. Turrets, bar & chuck
No. 36 Van Norman Pl. Miller, ram, '43
No. 2G Kempsmith Univ. Miller, 1943 (1)
No. 2416 Keller Duplicator, 3 dim., 3 spin.
No. 9J Gorton Elec. Duplicator, 1944
Gear Cutter, No. 13 B. & S., spur & bevel
30"x120" cen. Axelson Lathe, T.A.
30"x120" Hanchett Planto Surface Grinder
No. 2 Stand. K. & T. Univ. Miller, Timken
Gear Cutter, No. 13 B. & S., spur & bevel
12"x48" Hanchett Vert. Spin. Surface Grinder
96"x96"x24' N.B.P. Planer
6' 17" col. Carlton Radial, M on arm
8' Sturdybender Press Brake, 60 ton

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GRINDER—Blanchard 811 Rotary Surface
GRINDER—Cincinnati 12"x36" Universal
GRINDER—Heald 72A3 Internal Universal
THREAD GRINDER—J. & L. 6"x3" Internal
THREAD MILL—Hanson Whitney 8"x18" Int.

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7½ Ton Northern. Span 31'4". AC 220/3/60. Floor control.

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Ingersoll-Rand Type ES-1 Air Compressor, (1942) 1,000 Cu. Ft. per min. at 20 lbs. discharge. Complete with 75 HP Westinghouse Motor.
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"REBUILT — GUARANTEED"
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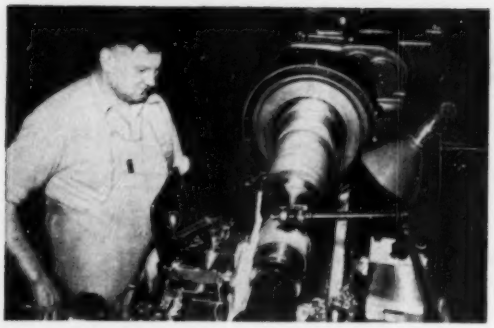

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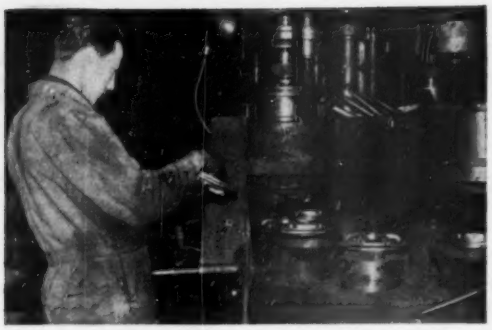
*Machine tool manufacturer**



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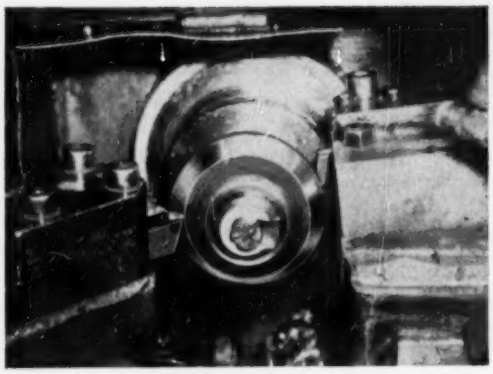
*Eastern washing machine manufacturer**

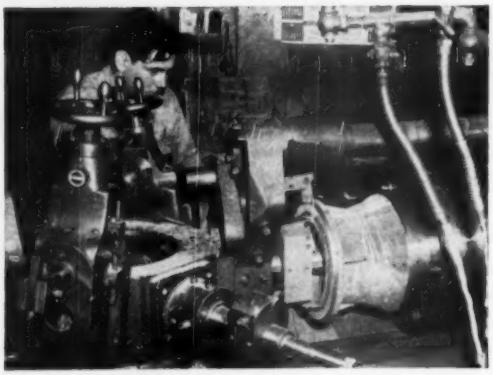
Carboloy, because it's uniform, pays off like this . . . plant-wide



3 Highest *plant-wide* average production per machine

"With fewer machine tools in operation, production was more than doubled, but cost per piece was not increased . . . despite material cost gains."

*Midwest manufacturer**



4 Close *plant-wide* production control standards to which you can absolutely adhere

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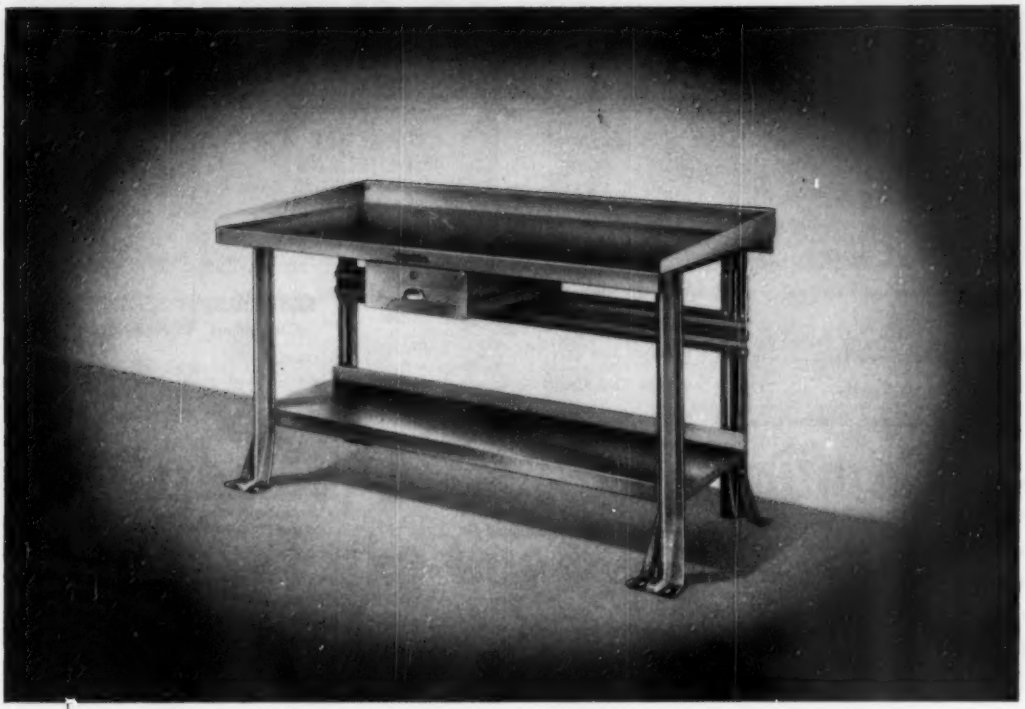

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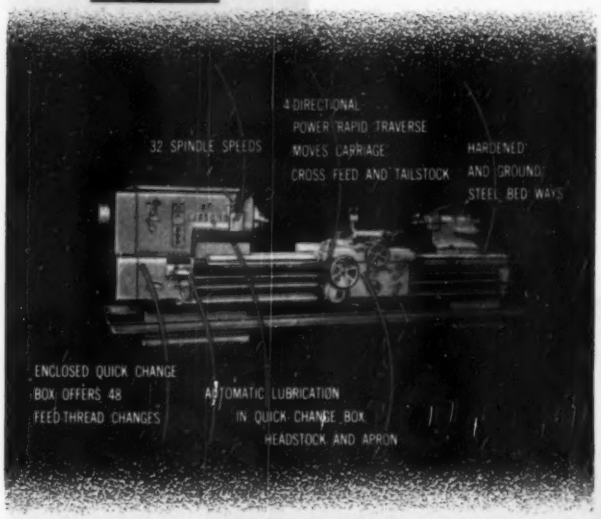
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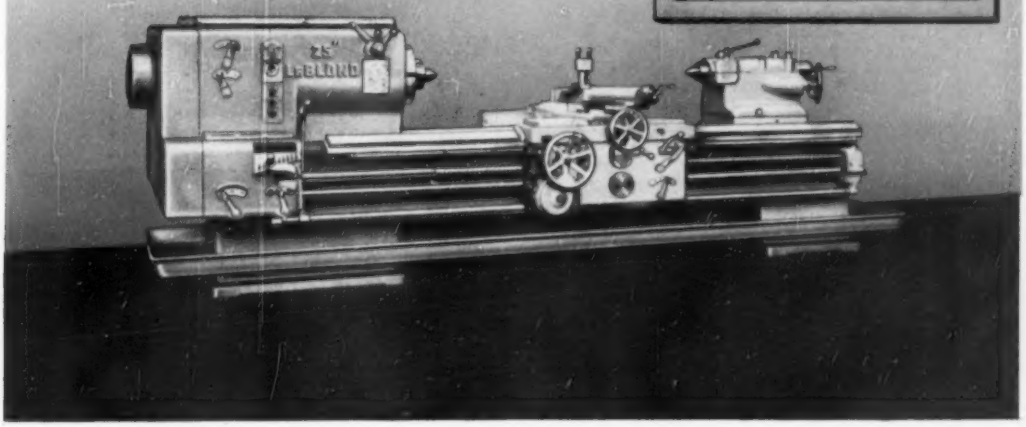

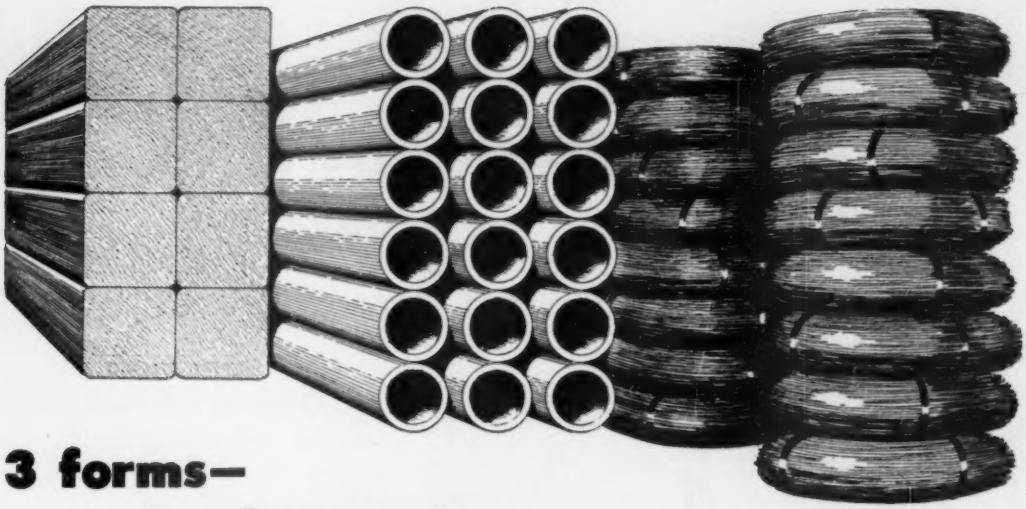

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